# Section 8 Treatment Options

#### 8.1 Introduction

As presented in Section 4, the future wastewater flows to be treated by the City in the year 2020 are estimated to be 531 million gallons per day (mgd) for average dry weather flow (ADWF). The HSA produces the majority of this flow at 511 mgd for ADWF.

Unlike the ADWF, the peak wet weather flow (PWWF) is subject to operation and collection system options, which produce different flow conditions for different combination of options. This will be discussed later in the alternatives analysis section. In general terms, the PWWF is expected to range from approximately 890 mgd to 1,050 mgd at the HTP in the year 2020.

To manage these future wastewater flows in the HSA, the Phase I (IPWP) guiding principles recommended building new wastewater facilities upstream in the system as well as focusing on lower-cost solutions.

This section focuses on the options for each treatment facility. The development of options constitutes the first step in the process. In section 10, these treatment options will be combined with the collection system and biosolids options to produce a complete wastewater alternative. Ultimately, the wastewater, runoff and recycled water alternatives will be combined to form our integrated alternatives.

The four options for HSA that were investigated for the Phase II IRP include:

- 1. New upstream water reclamation plant(s).
- Expansion of the existing upstream treatment facilities TWRP and the LAGWRP.
- Expansion of HTP.
- 4. Some combination of any or all of the above options.

This section will present these options as well as provide information and recommendations on new and innovative technologies, which could be studied for possible implementation.



# 8.1.1 Treatment Gap Analysis

The first step in developing the options is to identify the needs or "gaps" in the treatment system. As indicated above, the total wastewater flow is estimated to be 531 mgd to the City facilities, with the HSA estimated to be 511 mgd. The treatment facilities (TWRP, LAGWRP, HTP, and TITP) have a total capacity of about 550 mgd (520 mgd in HSA). This assumes the capacity reductions at TWRP and LAGWRP, as well as the discharge of the waste sludge to HTP for treatment. Figure 8-1 summarizes the existing facilities.

These totals seem to indicate that there is no need for expansion or upgrade of any facilities. However, as discussed in Section 3, NPDES permit limits for TWRP and LAGWRP may require that they be upgraded to advanced treatment to discharge to the LA River. In this case, the options may include converting a portion or all of the plants to recycled water only with no LA River discharge. If the plants are upgraded to advanced treatment, an option may include discharge of the waste brine to the sewer for treatment at HTP. Either of these cases will reduce the effective capacities of TWRP and LAGWRP. These possible options are discussed in more detail later in this section. A worst case application of these changes could lower the total system capacity to about 507 mgd (496 mgd in HSA). Figure 8-2 illustrates this worst case. To handle this reduction in effective capacity, some expansion and upgrade within the system would be required.

Another factor to consider is the possible diversion of dry weather urban runoff (DWUR) to the wastewater system. This is already being planned and constructed for areas in the Santa Monica Bay Watershed (see Runoff Management Volume). At a minimum, the amount of DWUR diversion would be about 8 mgd from these coastal diversions (in the HSA only). If DWUR within the rest of the City were diverted to the wastewater system, an additional 44 mgd would be added. If DWUR from the entire watersheds which flow through the City were also diverted, that would be an additional 29 mgd. Therefore, the range of possible DWUR flows is 8 to 81 mgd. The increased estimated year 2020 HSA flows would be 519 to 592 mgd. Again, these increases may require expansions and upgrades to the facilities.

One last factor in determining the system "gaps" is the effect of the treatment facilities on the collection system. Section 5 and 6 discuss the issues and needs of the collection system. The options discussed in this section can have a significant impact on the collection system. The primary needs in the collection system are upstream of TWRP, downstream of TWRP to the VSL/FA gate, the Tunnel downstream of the VSL/FA gate to HTP. Options at the upstream treatment plants or a new plant may provide relief of the last two collection system needs. Figure 8-3 identifies the needs of the collection system.



# 8.2 Innovative Technologies

To increase the efficiency of the wastewater treatment facilities and the entire wastewater system, some innovative technologies may be considered. For the IRP, "innovative" technologies are those that either improve treatment capabilities, or have other benefits such as a smaller footprint. With feedback from the Steering Group, the team has also investigated technologies that would provide a more decentralized treatment capability.

Some of these technologies have already been developed, and others are projected to be available by the year 2020. The potential innovative treatment technologies are considered in five categories: preliminary treatment, primary treatment, secondary treatment, final clarification, wastewater filtration technologies, and technologies for decentralized treatment.

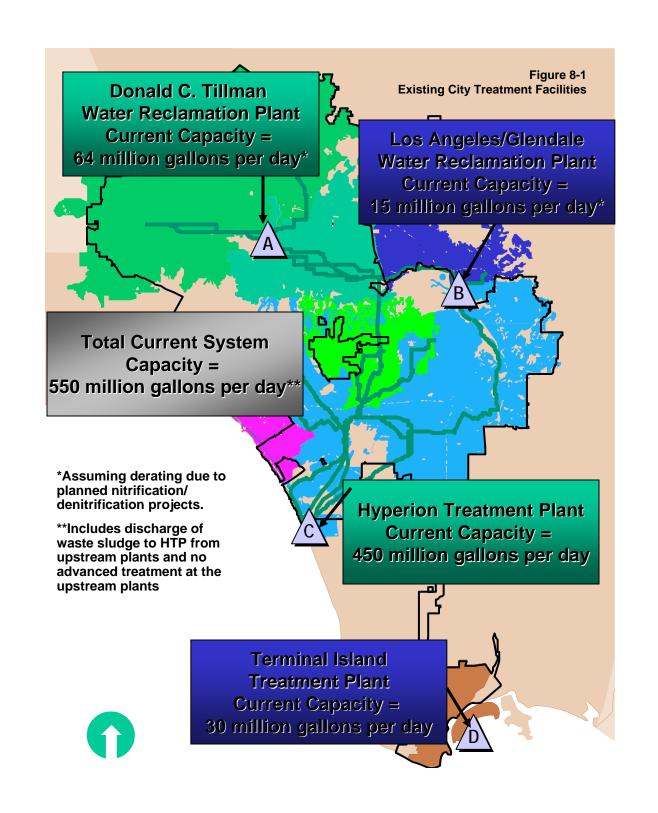
# 8.2.1 Innovative Technologies Summary

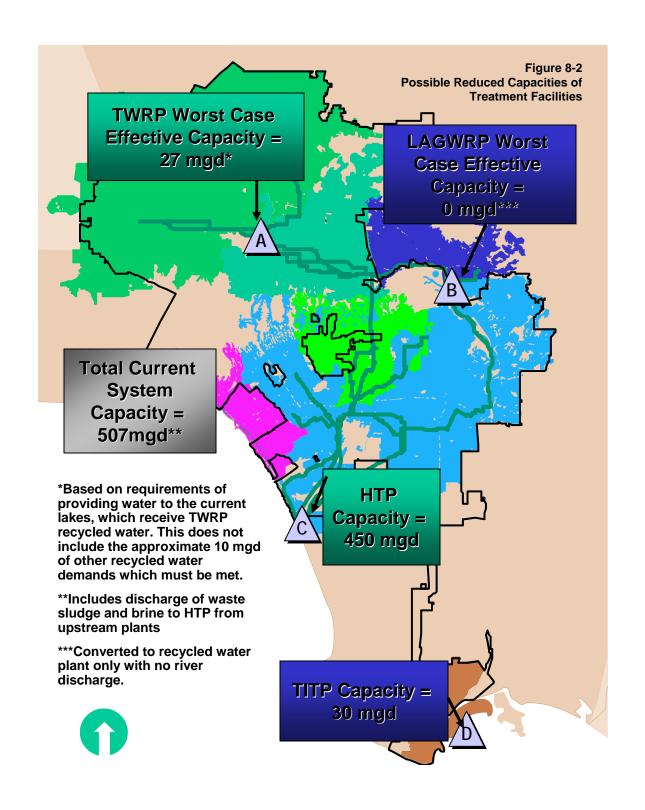
A summary of potential treatment technologies and their applicability to the treatment of liquid streams at the City's four wastewater treatment plants are provided in Tables 8-1 through 8-5. This is not intended to be a comprehensive accounting of all possible technologies; rather, a sampling of key technologies typically applied to municipal wastewater are presented for consideration under the IRP planning study.

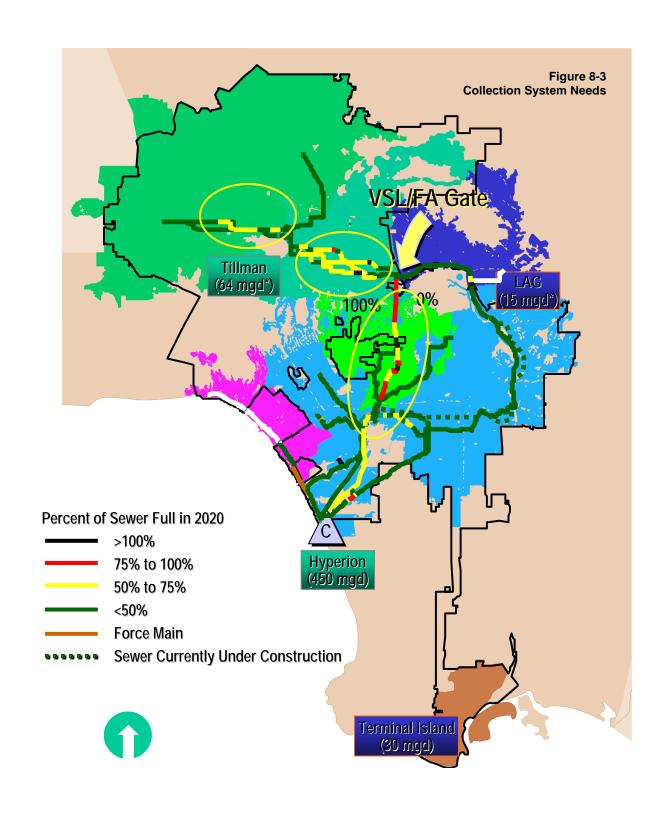
# 8.2.2 Innovative Technologies for Decentralized Treatment

The IRP Steering Group has expressed much interest in the option of creating a more decentralized wastewater treatment system. By creating a more decentralized system, the burden (or benefits) of the wastewater treatment is more equally distributed among the communities. The extent of the decentralization can go as far as individual households. This section presents, in general terms, two technologies which were put forth by the Steering Group for the IRP to investigate.









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		Table 8-1						
	Si	ummary of Innovative Preliminary	Treatment Process	ses				
			Treatment Plant Applicability					
Process	Merits	Drawbacks	TWRP	LAGWRP	HTP	TITP		
Influent Screeni	ing							
	No moving parts below the water							
	level	<ul><li>Single cleaning mechanism</li></ul>				Potential retrofit		
	■ Proven technology	<ul><li>Not suited for deep channels</li></ul>		Current		based on future screening		
Climber-type	■ Several manufacturers	■ Limited to 3/8 " bar spacing	Current installation	installation	Current installation	requirements		
		<ul><li>Limited number of proven</li></ul>						
		manufacturers available						
	<ul><li>Applicable down to very fine</li></ul>	<ul><li>Large objects can damage links</li></ul>						
	openings (3mm)	<ul><li>Some screen sections always</li></ul>				Applicable for retrofit if fine		
	<ul><li>Continuous cleaning available</li></ul>	below water level	Could retrofit to	Could retrofit to	Could retrofit to finer			
Filter-type	■ Non-metallic construction	■ Greaseblinding a problem	finer opening	finer opening	opening	desired		
	■ Eliminates putrescible material							
	(fecal matter and organics) from							
	screenings	<ul> <li>Additional equipment to maintain</li> </ul>	<b>N</b> 1/A					
	<ul><li>Allows use of fine screens with</li></ul>	in screenings area	N/A					
		Can be clogged with oversized			Similar to current ystem.			
Screenings	<ul> <li>Reduces odor in screening area</li> </ul>	debris			Could retrofit in			
Washing	and in final screening product	Leaves a wet product		N/A	tuture if applicable	Likely desirable		
		<ul> <li>Additional equipment to maintain</li> </ul>						
		in screenings area						
		Potential for clogging if out of			Circilo e to occurso of			
	up to 75%	service for extended period			Similar to current system. Could			
Screenings	Good odor control measure	Equipment can require significant			retrofit in future if			
Compaction	End product is easy to handle	maintenance	N/A	N/A	applicable	Likely desirable		



		Table 8-1					
	S	ummary of Innovative Preliminary	Treatment Proces	ses			
			Treatment Plant Applicability				
Process	Merits	Drawbacks	TWRP	LAGWRP	НТР	TITP	
Fine Screening	<ul> <li>Can eliminate need for primary treatment</li> <li>Reduces/eliminates identifiable material in sludge end product</li> <li>Protects downstream equipment</li> </ul>	<ul> <li>Subject to clogging by grease</li> <li>Expensive/complex machinery</li> <li>End product a semi-sludge that must be handled</li> <li>Biochemical Oxygen</li> <li>Demand/Total Suspended Solids removals typically not comparable to primary treatment</li> </ul>	Could retrofit but not likely applicable	Could retrofit but not likely applicable	N/A	Could retrofit but not likely applicable	
Grit Removal		comparable to primary treatment					
Induced Vortex Grit Separation	<ul> <li>Compact unit</li> <li>Moving parts generally not in grit</li> </ul>	<ul> <li>Limited manufacturers</li> <li>Sensitive to proper geometry and hydraulics</li> <li>Tall structure profile</li> </ul>	Could retrofit existing units	Should add in future as none provided now	Could retrofit existing aerated tanks to vortex in the future for more efficient operation	Could retrofit existing aerated tanks to vortex in the future for more efficient operation	
Free vortex grit separation	■ Suitable for degritting sludge	<ul> <li>Range of flows limited. Multiple units likely required</li> <li>Requires high head loss</li> <li>Very limited manufacturers</li> <li>Steel construction</li> </ul>	Not likely applicable due to head required	Could retrofit but would require pump re-build. Not likely	tN/A	N/A	
Grit Separation/ Classification	<ul> <li>Removes organic material from separated grit</li> <li>Dewaters grit</li> <li>Reduces odors and vector attraction from grit handling area</li> </ul>	<ul> <li>Can return grit to process, if plugged</li> <li>Equipment is high maintenance</li> </ul>	N/A	N/A	Existing	Existing	

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		Table 8-2				
		Summary of Innovative Primary Tre	atment Processes			
Dragon	Merits	Drawbacks	TWDD		nt Applicability HTP	TITP
Process Rectangular Primary			TWRP Could optimize	LAGWRP Could optimize	Could optimize	Could optimize
Clarifiers		■ High maintenance	hydraulics and	hydraulics and	hydraulics and	hydraulics and
	Compact layout	<ul><li>Odor source</li></ul>	retrofit with non-	retrofit with non-	retrofit with non-	retrofit with non-
	■ Non-metallic equipment	<ul><li>Sludge highly putrescible</li></ul>	metallic hardware	metallic hardware		metallic hardware,
	available; chains, flights, and	•			hardware, if applicable	if applicable
	sprockets				арріїсавіс	
	■ Can provide ideal sludge					
	pumping conditions					
	■ City familiarity					
Circular Primary	■ Low cost construction	■ Not land efficient; no common-	N/A	N/A	N/A	N/A
Clarifiers	■ Drive mechanism is simple and	wall				
	low maintenance	■ Long sludge suction lines; at least				
	■ Can be constructed with	the tank radius				
	thickening hoppers	■ Steel mechanism construction,				
	•	subject to corrosion				
Chemically-	■ Enhanced TSS and BOD	■ Increased sludge production	Could incorporate			Could incorporate
Enhanced Primary Clarification	removal	■ Typical chemicals used can be	if applicable	if applicable	(Note that HTP has experienced	if applicable
Glarinoation	<ul> <li>Can relieve overloaded aeration</li> </ul>	corrosive			decreased sludge	
	basins	■ Cost of additional chemical feed			density)	
	■ Minimal new construction	■ Decreased sludge density				
	required	(depending on type of				
	<ul><li>Can be retrofit to existing</li></ul>	coagulant(s) used)				
	clarifiers					
	■ Some chemicals can provide					
	H <sub>2</sub> S control					
	■ Enhanced sludge thickening					
	(depending on type of					
	coagulant(s) used)					



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		Table 8-2				
		Summary of Innovative Primary T	reatment Processes			
_		Drawbacks			nt Applicability	
Process	Merits		TWRP	LAGWRP	HTP	TITP
	<ul><li>Nutrient removal</li></ul>					
Ballasted Flocculation/ Settling	<ul> <li>Requires least footprint of all options</li> <li>Can start up and shut down very quickly</li> <li>Will operate successfully over a wide range of flow rates</li> </ul>	<ul> <li>Mechanically complex</li> <li>New Technology</li> <li>Limited Vendors</li> </ul>	Could retrofit if land a premium	Could retrofit if land a premium	Could retrofit if land a premium	Could retrofit if land a premium
Fine Screening	■ See Preliminary	■ See Preliminary	Could incorporate in lieu of existing or new primaries but not likely applicable	Could incorporate in lieu of existing or new primaries but not likely applicable	N/A	Could incorporate in lieu of existing or new primaries but not likely applicable
Primary Sludge Fermentation	<ul> <li>Enhances the performance of biological nutrient removal systems, especially phosphorus removal</li> <li>Can be retrofit to existing clarifiers</li> </ul>	<ul> <li>Can be source of odors</li> <li>Recirculation of primary sludge can cause clogging of pipes/pumps</li> </ul>	Could incorporate if nutrient removal required			Could incorporate lif nutrient removal required

		Table 8-3				
		Summary of Innovative Secondar	y Treatment Proces			
Process	Merits	Drawbacks	TWRP	Treatment PI LAGWRP	ant Applicability HTP	TITP
Aeration	morres	Diawadic	1441(1	LAOWINI		
Fine Bubble	<ul> <li>Proven Technology</li> <li>One of the most energy efficient aeration technologies available</li> <li>Several vendors available</li> <li>Can utilize membranes or ceramics</li> <li>Can retrofit to existing basins</li> </ul>	<ul><li>High initial capital cost</li><li>Potential for fouling</li></ul>	Current application. Can upgrade as technology develops	Current application. Can upgrade as technology develops	N/A	Current application. Can upgrade as technology develops
Aeration Panels	■ The most efficient air aeration device available	<ul> <li>New technology</li> <li>Single vendor</li> <li>Very high initial capital cost</li> <li>Long term performance history not available</li> </ul>	Could replace if economics warrant	Could replace if economics warrant	N/A	Could replace if economics warrant
Oxygen Injection	<ul> <li>High product utilization due to pure oxygen</li> <li>Highest oxygenation capacity for basin size</li> <li>Suitable to retrofit to existing basins</li> <li>Can supplement overloaded aeration system</li> <li>Small footprint</li> </ul>		N/A unless supplemental may be required	N/A unless supplemental may be required	Current system	N/A unless supplemental may be required



		Table 8-3				
		Summary of Innovative Secondar	ry Treatment Processes  Treatment Plant Applicability			
Process	Merits	Drawbacks	TWRP	LAGWRP	HTP	TITP
Biomixer	<ul> <li>High efficiency system</li> <li>Can be retrofit to existing basins</li> <li>Can supplement or replace existing</li> </ul>		N/A	N/A	N/A	N/A
Basin Configuration	<u> </u>	<u> </u>				
Aerobic, Anoxic, and Anaerobic Selectors	<ul> <li>Conditioning step for activated sludge biomass to encourage predominance of floc forming organisms which provide good sludge settlability</li> <li>Generally adaptable to retrofit</li> </ul>	<ul> <li>Additional construction</li> <li>Sludge may be over-conditioned</li> <li>Can be ineffective against certain microorganisms</li> <li>Additional Equipment to maintain</li> <li>Pilot study may be required</li> </ul>	Can be retrofitted, applicable	ifCan be retrofitted, if applicable	Limited application to High Purity Oxygen basins. However, is currently installed in two of the reactors	Can be retrofitted, in applicable
Biological Nutrient Removal	<ul> <li>Low cost nutrient control</li> <li>Does not create additional by products</li> <li>Sludge conditioning (Selector</li> </ul>	<ul> <li>Limits sludge handling alternatives</li> <li>Additional process monitoring often required</li> <li>Can create excess biological froth</li> <li>Basin design can be complex</li> <li>Additional mixing equipment to maintain</li> </ul>	Can be retrofitted, applicable	if Can be retrofitted, if applicable	Certain aspects can be retrofit. HPO systems more difficult to completely retrofit Nutrient removal not normally warranted for coastal discharge	Can be retrofit, if applicable

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		Table 8-3				
		Summary of Innovative Secondar	y Treatment Proces			
Process	Merits	Drawbacks	TWRP	Treatment P LAGWRP	lant Applicability HTP	TITP
Step Feed	■ Improved process kinetics	<ul><li>Flow split can be complex</li><li>Generally difficult to retrofit properly</li></ul>	Current system accommodates this mode of operation	Current system	N/A	Current system accommodates this mode of operation
Coupled Processe	•					
Roughing Filter/Activated Sludge (RF/AS)  Biofilter/Activated Sludge (BF/AS)	<ul> <li>Filter provides effective buffer for AS system from slug (shock) loads in the influent</li> <li>Filter can absorb toxic load and protect system</li> <li>Can be used to upgrade AS systems</li> <li>Results in well settling sludge. Minimizes filamentous organisms</li> <li>Often used to upgrade ABF systems</li> <li>Generally better performance than ABF alone</li> </ul>	Activated Sludge  Added cost may not be	N/A	N/A	N/A	N/A
Trickling Filter/Solids Contact (TF/SC)	<ul> <li>Achieves sludge flocculation and removal of otherwise dispersed solids</li> <li>Well suited for upgrade of existing TF systems</li> </ul>	<ul> <li>For new facility, greatly more expensive than Activated Sludge alone</li> <li>Does not attain performance levels of Activated Sludge</li> <li>Multiple processes to operate and maintain</li> </ul>	N/A	N/A	N/A	N/A



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		Table 8-3				
	S	Summary of Innovative Secondar	y Treatment Proces			
Process	Merits	Drawbacks	TWRP	LAGWRP	ant Applicability HTP	TITP
Captive Media		<ul> <li>Currently an emerging technology</li> <li>Performance, cost competitiveness, and experience is not well established</li> </ul>	Potential candidate for future upgrade, if appropriate		Potential candidate for future upgrade,	Potential candidate for future upgrade, if appropriate
Final Clarification	:				_	
Rectangular Final Clarifiers	<ul> <li>Proven Technology</li> <li>Compact layout</li> <li>Non-metallic equipment available; chains, flights, and sprockets</li> <li>Can provide ideal sludge pumping conditions</li> <li>City familiarity</li> </ul>	■ High maintenance	Could optimize hydraulics and retrofit with non-metallic hardware, if applicable	Could optimize hydraulics and retrofit with non- metallic hardware, if applicable	May consider for future clarifiers, since they have smaller footprint and may have better performance than current circular clarifiers	Could optimize hydraulics and retrofit with non-metallic hardware, if applicable
Circular Final Clarifiers	■ Drive mechanism is simple and	<ul> <li>Not land efficient; no commonwall</li> <li>Long sludge suction lines; at least the tank radius</li> <li>Steel mechanism construction, subject to corrosion</li> </ul>	N/A	N/A	36 Currently installed	N/A
Conventional Clarifiers	<ul> <li>Technology well established</li> <li>Performance capabilities         recognized and generally         incorporated into NPDES         Permits</li> <li>Cost effective</li> </ul>	<ul> <li>Subject to upset by transient loadings</li> <li>Require large land area</li> <li>Rectangular clarifiers need special design</li> </ul>	Current system	Current system	Current system	Current system



		Table 8-3				
	S	ummary of Innovative Secondary	y Treatment Proces			
D	B#tr -	Donald a also	TWOD		ant Applicability	TITO
Process Optimized Clarifiers	Merits     Merits of conventional clarifiers retained     Design refinements based on decades of actual performance observations     Improvements can be tailored to specific clarifiers	Drawbacks      Added costs can be substantial     Addition of equipment and appurtenances can increase maintenance needs	TWRP Specific enhancements can be made on a case- by-case basis, as needed.	can be made on a case-by-case	enhancements can be made on a	TITP Specific enhancements can be made on a case- by-case basis, as needed.
Membrane Clarification	<ul> <li>Eliminates the need for final clarifiers</li> <li>Can support substantially higher MLSS concentrations than conventional or optimized clarifiers</li> <li>Filtration process will outperform sedimentation</li> <li>Superior effluent quality; exceeding that of filtered secondary effluent</li> <li>Positive barrier to pathogens</li> </ul>	■ Emerging technology with somewhat limited experience	Potential candidate for expansion or upgrade	Potential candidate for expansion or upgrade	N/A	N/A
Stacked Clarifiers	<ul> <li>Reduced area requirements for clarification</li> <li>Less exposed surface area</li> </ul>	<ul> <li>Substantially more construction cost than conventional</li> <li>Less knowledge of the technology in the profession</li> <li>Deep excavation required</li> <li>Limited access to mechanism</li> </ul>	Potential candidate for expansion, if applicable	candidate for	for expansion, if	Potential candidate for expansion, if applicable



			Table 8-4				
			Summary of Innovative Filt	ration Processes			
Dunnan	Monito		Duavila alva	TWDD		Plant Applicability	
Process Conventional	Merits	-	Drawbacks	TWRP Potential candidate	LAGWRP	N/A	TITP Current technology
Granular Bed	<ul> <li>Well established technology,</li> </ul>		Expensive basin design	for expansion of		IVA	Current technology
	with longest track record of any		Requires high backwash rates	upgradė	0,		
	filtration process		Backwash a batch process				
	<ul><li>Most applications in service</li></ul>		which requires equalization of				
	■ Performance well proven		backwash water before				
	High solids holding capacity		returning to process				
	Reasonably resilient to solids		Operator attention				
	or turbidity breakthrough		recommended for backwashing				
	<ul><li>Not proprietary; components</li></ul>						
	can be individually specified						
Moving Bed Filters	<ul><li>Simplicity of operation</li></ul>		For large applications, number	Potential candidate for expansion of		N/A	N/A
	<ul><li>Modular construction</li></ul>		of filter modules required can	upgrade	1		
	■ Technology reasonably well		become substantial				
	established	<b>=</b> ;	Somewhat unconventional filter				
	<ul><li>Low-rate continuous backwash</li></ul>		design; substantially different				
	eliminates need for		from most conventional filters				
	equalization	-	Continuously moving filter				
	■ Low head loss across filter		media can cause internal				
	■ Deep bed filters available		abrasion				
		-	Few large installations to date				
Traveling Bridge	● One of the least cost filters		Filtration is by surface straining	Current technology	/N/A	N/A	N/A
Filters	■ Backwash return low and		which has very limited solids	in use			
	equalization not required		accumulation capability				
	■ Low operating head loss	-	Limited to low filtration rates				
	required		Travelling bridge is				
	■ Shallow bed construction		mechanically complex and				
			subject to breakdown				
			Porous plate underdrains				

		Table 8-4				
		Summary of Innovative Filt	ration Processes	Tractment DI	ant Annliachilit	
Process	Merits	Drawbacks	TWRP	LAGWRP	ant Applicability HTP	y TITP
		subject to fouling  Regulatory agencies not convinced of efficiency				
Cloth Media Filte (Aqua Disk)	<ul> <li>Compact installation</li> <li>Filtration through cloth media precludes upset of filter matrix</li> <li>Underdrains not employed</li> <li>Operates w/ minimal headloss</li> </ul>	<ul><li>New technology</li><li>No long term installations</li><li>No large installations</li></ul>	N/A	N/A	N/A	N/A
Compressible Media Filters (Fuzzy Filter)	<ul> <li>Very high filtration rates</li> <li>Filter medium and filter bed properties can be altered by compressing the medium</li> <li>Filter media is totally confined</li> <li>Underdrain systems eliminated</li> </ul>	<ul> <li>New to emerging technology</li> <li>Applications and experience very limited</li> </ul>	N/A Emerging technology whose applicability is still in question at this scale	N/A Emerging technology whose applicability is still in question at this scale	N/A	N/A
Membrane Technologies:	<ul> <li>Wide range of pore sizes available</li> <li>Can pre-treat as well as finish treat secondary effluent</li> <li>Filtration efficiencies from micro-filtration to reverse osmosis available</li> <li>Treatment goals of nutrient removal, softening, disinfection, and desalination can be met</li> </ul>	<ul> <li>Application to wastewater effluents limited</li> <li>Pretreatment required for the finer membranes</li> <li>High pressure/high energy systems generally required</li> <li>High cost of operation</li> <li>Warranted for only the most stringent effluent requirements</li> </ul>	Potential candidate for expansion o upgrade	ePotential rcandidate for expansion or upgrade		First phase i operational. Likel candidate for future expansions



		Table 8-4								
Summary of Innovative Filtration Processes										
					ant Applicability					
Process	Merits	Drawbacks	TWRP	LAGWRP	HTP	TITP				
Immersed	■ See section on Membrane			Emerging	N/A	N/A				
Membranes	Clarification in Secondary		technology which could be a potential	technology which could be a						
	Treatment Processes heading		_	potential						
			expansion or	candidate fo	r					
			. •	expansion o	r					
				upgrade						
Primary Effluent	■ Alters the TSS size distribution	■ Subject to clogging from	N/A	N/A	N/A	N/A				
Filtration	of primary effluents	greases and oils contained in								
	■ Generally renders the primary	primary effluent								
	effluent amenable to high	<ul> <li>Generally only applicable as</li> </ul>								
	efficiency treatment in fixed-	fixed film pretreatment or as								
	film reactors	reduced level of treatment								
		compared to AS								

				Table 8-5					
				<b>Summary of Innovative Disinfect</b>	ion Processes				
Process Merits			Drewkeeke		Treatment Plant Applicability				TITP
Process Chlorination with	Ł			Drawbacks	TWRP Current system	LAGWRP Current system	N	HTP I/A	N/A
sodium hypochlorite		Retains advantages and		Still leaves disinfection byproducts	Current system	Current system	I N	//	N/A
,,,		efficiencies of halogen		associated with chlorination					
		disinfection		Bisulfite required for dechlorination					
		Eliminates the hazards of							
		dealing with compressed toxic							
		gases							
		Available for sludge							
		conditioning in AS system							
		On-site generation available							
Ultraviolet		No storage/handling/feeding of		High cost/ high energy alternative	Potential	Potential candidate	N.	I/A	N/A
Irradiation (UV)		hazardous chemicals	= Maintananaa and rankaaamant af	candidate for future upgrade	for future upgrade				
		Effective disinfectant,		bulbs costly	rata. o apgrado				
		comparable to chlorination		Dependent on high light					
		Technology proven		transmissivity of treated water					
		Requires very small footprint	•	Relatively new technology					
		No formation of		Not effective for sludge					
		trihalomethanes		conditioning. Supplemental					
		NDMA reduction		hypochlorite required					
				No residual					
				Spent bulbs may be a disposal					
				problem					
Advanced Oxidation	) <b>—</b>	Highly effective against Giardia	•	Most expensive of disinfection	N/A	N/A	N.	I/A	N/A
(AO)		and Cryptosporidium		technologies					
		No formation of	-	Least applied to date					
		trihalomethanes		Not effective for sludge					
		Effective oxidant		conditioning. Supplemental					
				hypochlorite required					
				No residual					



#### 8.2.2.1 Composting Toilets

Composting toilets can be applied on a household basis. These units can either be individually self contained or as part of a multi-unit central building system.

A composting toilet has three basic elements: a place to sit, a composting chamber, and a drying tray. In general, the self contained models combine all three elements in a single enclosure. The central building systems have separate seating, with the composting chamber installed in the basement or under the house. In either case, the drying tray is positioned under the composting chamber, with a removable finishing drawer to collect the finished product. The components of a composting toilet take up generally the same amount of space as a traditional flush toilet in the restroom itself.

One key element in a successful installation is the ventilation. All composting toilets are connected to a vent with the outside, similar to a normal plumbing vent. In most units, a fan within the vent pulls air out of the unit, creating vacuum preventing odors from escaping into the room. The ventilation is also key to the composting process, which uses aerobic microbes to decompose the waste material.

To ensure adequate distribution of oxygen for faster composting action, a mixing or stirring mechanism must be employed. This can either be manual, via an external crank, or automatic. In general, most toilets also have an electric heating coil to help with the drying. Bulking material, such as peat moss, must also be added daily to properly compost the material.

The process can take between two months to one year, depending on use and design. In a properly installed and designed unit, the result is an odorless humus material totally unlike manure or the contents of a latrine. There is no danger in handling it and it may be used as fertilizer depending on local regulations.

A self contained individual unit costs between \$1,500 and \$2,000, not including installation. Operation and maintenance costs will vary depending on the installation, but would include the cost of the "bulking material" and electricity for the fan and heater. Note that the maintenance of one of these units does require some technical skill beyond the ability of a typical citizen. There also may be plumbing code issues concerning the installation of these units that would need to be addressed. It is estimated that an installation could reduce household water consumption by 25 percent.

#### 8.2.2.2 Package Treatment Plants

Package treatment plants are small to intermediate sized biological wastewater treatment systems. They are engineered and designed generally for areas that are temporarily or permanently outside the reach of municipal waste disposal systems. For the IRP, package plants could be considered for use on a neighborhood or development-sized basis. The idea being that in order to avoid expansion of the collection system in growing areas, package treatment plants could be installed to locally treat and discharge or reuse the wastewater.

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Package treatment plant units are modular and prefabricated designed for treatment of wastewater through activated sludge processes. They are generally self-contained, requiring minimal field assembly. The plants are designed to be easy to operate, with many automatic controls. Package plant systems are most appropriate for plant sizes that treat from 0.025 to 6.0mgd and most commonly treat flows between 0.01 and 0.25 mgd.

Operation requirements vary depending on state requirements for staffing package treatment systems. Staffing requirements for these systems are typically less than eight hours a day. Many plants are staffed for 2-3 hours per day. As with larger plants, these systems must submit regular reports to local agencies.

Some of the operational and design issues affecting the performance of a package plant include the following:

- Sudden temperature changes.
- Removal efficiency of grease and scum from the primary clarifier.
- Small flows that make designing self-cleaning conduits and channels difficult.
- Fluctuations in flow, BOD<sub>5</sub> loading, and other influent parameters.
- Sufficient control of the air supply rate.

While costs are site specific and generally depend on flow rate, influent wastewater characteristics, effluent discharge requirements, additional required equipment, solids handling equipment, etc., the cost per gallon treated is higher then with a centralized facility. There are two reasons for this difference. First, each facility would need to have redundant equipment to consistently remove flow from the collection system. This additional equipment adds to the capital as well as operations costs. Secondly, there is a significant increase in operations and maintenance personnel needed to service many remotely located facilities.

In general, package treatment plants are applicable for areas with a limited number of people and small wastewater flows. They are most often used in remote locations such as trailer parks, highway rest areas, and rural areas. They can be useful for large systems on a case by case basis, but at a higher cost.



Table 8-6						
Summary of Innovative Technologies for Decentralized Treatment						
Process	Merits	Drawbacks				
Composting Toilets	<ul> <li>Provides decentralized treatment of wastewater which provides relief to the collection and treatment facilities.</li> <li>Reduces household water consumption.</li> </ul>	<ul> <li>Can produce odor if not properly installed.</li> <li>If not properly designed and installed, complete composting may not occur.</li> <li>Requires some technical skill to maintain.</li> <li>Current plumbing codes may need to be adjusted or changed to allow use.</li> <li>Use may be regulated and disposal at a landfill may be required.</li> </ul>				
Package Treatment Plants	Provides decentralized treatment of wastewater which provides relief to the collection.	<ul> <li>Capital costs are more per gallon than for larger facilities.</li> <li>Operations on many small facilities will require more manpower and maintenance.</li> <li>Fluctuations in flows and constituents can be difficult to handle.</li> </ul>				

# 8.3 Constructed Wetlands

A constructed wetland is a biological treatment technology designed to mimic processes found in natural wetland ecosystems. These wetland systems utilize wetland plants, soil and the associated microorganisms to remove contaminants found in wastewater and stormwater. The installation of these systems also provides the opportunities to create or restore wetland habitat for wildlife and environmental improvement.

A typical constructed wetland is a series of rectangular plots that are filled with uniform graded sand or gravel. The bottom of the plot can be lined with materials like concrete or plastic to prevent possible contamination of the groundwater. The root mass of the wetland plants provides filtration as well as oxygen and carbon for water treatment. The roots also offer attachment sites for microbes that consume the available oxygen in the process of breaking down pollutants. Constructed wetlands can be further classified according to the flow pattern. The most common flow patterns used are: free water surface flow, subsurface flow, vertical flow, and hybrid (i.e. combinations of the previous) flow.



The primary benefits of constructed wetlands include:

- Removal of nutrients
- Dissolved pollutants
- Retard runoff rates
- Provide retention
- Create or restore wetland habitat for wildlife

Some of the challenges to implementing the use of constructed wetlands include:

- Wetlands consume a relatively large amount of space, making them an impractical option on many sites where surface land area is constrained or land prices are high.
- Although design features can minimize the potential of wetlands to become a breeding area for mosquitoes, there can be public perception that wetlands are a mosquito source.
- Wetlands require careful design and planning to ensure that wetland plants survive and flourish after construction.
- Some evidence exists that stormwater wetlands can release some nutrients during the non-growing season.
- Liability.
- Operations and maintenance costs.

Typical construction costs for wetlands are about \$0.65 to \$1.25 per acre, not including land purchase.

# 8.4 Hyperion Treatment Plant (HTP) Options 8.4.1 HTP Introduction

The two basic options for HTP are expansion and no expansion. As the influent flows to HTP are affected by the operation of the upstream water reclamation plants TWRP and LAGWRP, the need to expand HTP is determined by the treatment capacity of these facilities and the resulting flow to HTP. This is true for both ADWF and PWWF. PWWF is also affected by collection system options, however. Figure 8-4 illustrates the interrelationship between the upstream plants and HTP.

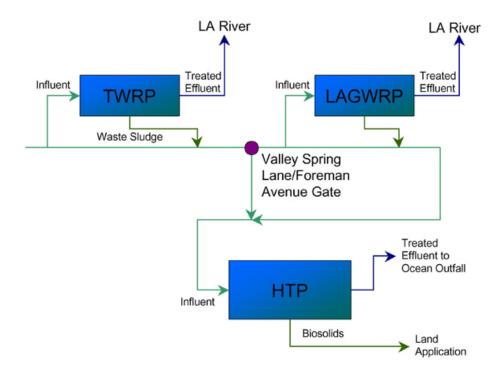


Figure 8-4 Interrelationship of Upstream Plants with Hyperion Treatment Plant

The no expansion option would primarily be associated with the options of expansion at the upstream plants or construction of a new facility (or facilities), which would result in a flow at HTP of less than its current dry weather capacity of 450 mgd.

The focus of this discussion is on the potential option of expanding HTP. This aligns with one of the IPWP Steering Group's subobjectives of enhancing the efficient use of system assets.

# 8.4.2 HTP Expansion Options

There are many different options for upstream treatment depending on the end use water quality goals, treatment technologies, flow demands, space requirements, etc. This results in a large number of possible flows and constituent mass loadings to HTP. However, an expansion scenario at HTP would not likely be limited to any of these specific influent flows. Instead, the facility would be expanded incrementally. The buildout capacity of HTP is assumed to be about 550 mgd for ADWF, based on information presented in the last published *Wastewater Facilities Plan* (DMJM/BV, 1990) and discussions with HTP plant, Wastewater Engineer Services Division (WESD), and Environmental Engineering Division (EED) staff. It is important to note that HTP could be expanded in small increments or in one expansion to its buildout capacity. Phasing will be developed for the recommended alternative which will be discussed in Section 10. For this discussion, we will look at the expansion to the 550 mgd buildout capacity.

The first step in developing the option to expand HTP to 550 mgd, was to identify the unit processes that would require upgrades. The higher influent flow rate of 550 mgd was inputted into the planning model (see Subsection 7.2 for more detail). The individual processes were then evaluated to determine the "bottlenecks" or shortfalls.

During the evaluation of the existing facilities, there were two scenarios identified for the oxygen reactors at HTP (see Subsection 7.3.5). The first scenario was that all the reactors would be converted to the selector (modified) mode of operation. The second scenario was that up to half of the reactors would be converted to selector mode with the rest to remain in the original configuration.

The reason for the use of these two options is that, currently, the selector modified reactors produce enhanced settling, but higher turbidity due to lack of filamentous microorganisms. City staff is currently investigating whether this issue can be managed with modifications to the reactors. However, at the time of this study the City's investigations were not completed.

The resulting process expansion requirements are listed in the following Table 8-7.

Table 8-7 Hyperion Treatment Plant Process Capacity Analysis for Upgrade to 550 mgd								
Current ADWF Required Modifications for								
Process	Capacity	Upgrade to 550 mgd						
Preliminary Treatment	800 mgd	None						
Primary Treatment	600 mgd	None						
Intermediate Pump Station	900 mgd	None						
Secondary Treatment								
Oxygen Reactors								
Option 1 (full selector)	900 mgd	None (2/3 of the modules would be in service)						
Option 2 (partial selector)	600 mgd	None (4 of 9 modules would be converted to selector)						



Table 8-7 Hyperion Treatment Plant Process Capacity Analysis for Upgrade to 550 mgd								
Current ADWF Required Modifications for Process Capacity Upgrade to 550 mgd								
Secondary Clarifiers								
Option 1 (full selector)	525 mgd	2 additional 150 feet diameter circular clarifiers would be needed.						
Option 2 (partial selector)	400 to 450 mgd	8 additional 150 feet diameter circular clarifiers would be needed.						
Anaerobic Digestion	450 mgd	6 to 12 additional modified egg shaped digesters would be needed depending on redundancy requirements.						

Within this basic expansion option at HTP, there are several different possibilities for location and configuration of the new facilities. The IRP team met with City staff to discuss these different alternatives. The results of these discussions are as follows (see also Figure 8-5):

- While the existing configuration of the secondary clarifiers is circular. Any new secondary clarifiers may be rectangular, due to possible space savings and enhanced treatment capacity with this configuration.
- New secondary clarifiers would first be located in the parking lot just north of Reactor Module 9. After this space is filled, they will either be placed in the location of the existing emergency storage basins just west of the parking lot or in the location of the former administration building. Another possibility in the case of Scenario 2 is to demolish two reactor modules (since there is excess capacity) and place the new clarifiers in the resulting space. Either way, installation of new clarifiers will present a challenge with respect to the flow conveyance from the reactors. Further study will be needed in the future on this topic.
- The location of the new modified egg shaped digesters will start in the area of the existing Conventional Digester Battery C and be in line with the existing modified egg shaped digesters.





Figure 8-5 Hyperion Treatment Plant Options: Expansion to 550 mgd

Figure backside



# 8.5 TWRP Options

#### 8.5.1 TWRP Introduction

In the initial development of the options for the upstream treatment facilities there were three factors to consider: the projected year 2020 flow generated by the tributary area (including potential dry weather urban runoff diversion), the recycled water demand, and the environmental goals. This section will investigate and discuss options that will effectively deal with these factors.

# 8.5.2 TWRP Site Capacity and Constraints

The current ADWF capacity of TWRP is assumed to be 64 mgd, based on a 20 percent derating of the facility from the NdN improvements (see Subsection 7.4 for more information).

The PWWF capacity of the plant is more complicated. In general, the existing facility was designed for a treated average wet weather capacity of one and one-half times the ADWF. Hydraulically, the plant was designed for two times the ADWF. Should advanced treatment such as microfiltration/reverse osmosis (MF/RO) be added, then the peaking ability of the plant is effectively removed. Storage can be added to help regain some of this wet weather peaking capability lost due to the advanced treatment.

For this discussion, we will size the storage tanks based on the following criteria:

- The storage tanks will hold two days of excess flow at 12 hours per day.
- There will be an additional 50 percent added for a safety factor.

As an example:

For an additional 40 mgd in flow capacity, the single day volume would equal 20 million gallons (MG) (i.e.  $40 \text{ mgd} \text{ x} \frac{1}{2} \text{ day}$ ). Therefore, the two day total would be 40 MG. The safety factor would add an additional 20 MG, for a total of 60 MG.

The result of this is that the additional capacity added by a storage tank during wet weather is about two-thirds of its volume. Note that the 60 MG tank (450 feet by 700 feet by 27 feet deep) in the example above would fit on the existing site. It would need to be buried and have significant odor control facilities.

TWRP was designed to be built in phases of 40 mgd, as with HTP, it can be built in smaller increments if needed. The smallest increment which will be investigated for this discussion will be 20 mgd. Table 8-8 summarizes the process capacities, dimensions, and the number of units in a 20 mgd phase. Based on the information in Table 8-8, the buildout capacity of the entire site is 200 mgd (see Figure 8-6). The capacity of the facility within the existing berm is approximately 120 mgd (see Figure 8-7).



Table 8-8 Tillman WRP Processes						
Unit	Process	Capacity per Unit	Dimensions	Number of Units per 20 mgd Phase*		
Preliminary Treatment	Bar Screens	30 mgd		1		
	Influent Pumps	32 mgd		1		
Primary Treatment	Primary Clarifiers	5 mgd	200' x 20' x 12' deep	4		
	Equalization Tanks	0.35 million gallons	200' x 20' x 12' deep	4		
Secondary Treatment	Aeration Tanks	5 mgd	300' x 36' x 16' deep	4		
	Secondary Clarifiers**	3.3 mgd	150' x 20' x 15' deep	6		
Tertiary Treatment	Filters	2 mgd	42' x 10'	10		
Advanced Treatment	Microfiltration Trains***	6 mgd	150' x 40'	3.5		
	Reverse Osmosis	5 mgd	40' x 45'	4		
Disinfection	Ultra-Violet	7.5 mgd	20' x 30'	3		

Notes:

# 8.5.3 TWRP Projected Year 2020 Flows and Demands

As discussed in Section 4, the projected year 2020 flows are 104 mgd for ADWF (with average GWI) and approximately 250 mgd to 275 mgd for PWWF.

There is also a possibility of approximately 17 mgd of DWUR being diverted to TWRP as part of the Runoff Options (see the Runoff Management Volume for further discussion). Based on these projections the ADWF could range from 104 to 121 mgd. For this discussion, capacities ranging from 64 mgd (current derated capacity) to 120 mgd will be examined. Note that any excess flow above this will bypass the facility and be conveyed to HTP.

#### 8.5.4 TWRP Treatment Goals

The environmental goals for TWRP depend on the end use (see Subsection 3.5.2). For recycled water, the goal is to meet current Title 22 requirements. For discharge to the LA River, it must meet a range developed from the various current and emerging regulations affecting discharge from TWRP. For the IRP, it was assumed that discharge to the LA River will require some level of advanced treatment by the year 2020. See Section 3 for additional discussions. To help simplify the options during the initial stages of alternative development, the advanced treatment will be provided by a combination of MF and RO.

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<sup>\*</sup> This does not include any redundant units

<sup>\*\*</sup> The secondary clarifiers are based on the dimensions from the old HTP design

<sup>\*\*</sup> Each microfiltration train contains eight units

Note that a TM was prepared as part of the IRP to investigate the feasibility of using membrane bioreactors (MBR) with the RO instead of the MF (see Draft Technical Memorandum – Evaluation of MBR/RO Treatment at TWRP and LAGWRP, March 2, 2003). The results of this study indicate that there could be potential cost and space savings associated with the use of MBRs. However, more testing will need to be completed before this is considered a viable option. Therefore, initial options analysis will focus on the MF/RO combination.

TWRP currently provides flow to the Japanese Gardens, Lake Balboa, and the Wildlife Lake which totals about 27 mgd. Each of these water bodies discharge directly to the LA River. For comparison purposes only, the IRP will investigate supplementing these features with potable water.

# 8.5.5 TWRP Assumptions Summary

The general assumptions used for the TWRP options are the following:

- Any discharge to the LA River requires advanced treatment.
- Assume brine disposal will be discharged to the sewer. Note that further study will be needed to determine the effects on HTP. A local or regional brine line will be considered as an alternate.
- Other recycled water applications must only meet current Title 22 requirements.
- Discharge limits will be the same for dry and wet weather at the upstream facilities. Note that currently they have a different limit for turbidity during storm events, which gives them the option to bypass the tertiary filters. However, all the other constituents in the 1998 NPDES Permit do not have different limits.
- Nitrification/ denitrification (NdN) conversion is considered existing situation.
- NdN conversion at TWRP will require derating by 20 percent.
- Replacement of tertiary filters at TWRP is considered to be the existing situation.
- Waste sludge discharged back to sewer is assumed to be 6.5 percent of influent flow for TWRP. The sludge waste is based on historical information provided by the City.
- The assumed brine return rates are 10 percent for MF and 15 percent for RO.



# 8.5.6 TWRP Options

There are three general options for TWRP as follows:

 No expansion or advanced treatment upgrade - In this case, TWRP would become a recycled water plant only, providing little or no reliable treatment or flow relief (assuming discharge to the LA River requires advanced treatment). This option would still allow for recycled water production, while avoiding the large costs associated with upgrading to advanced treatment. However, this option would require either removing or identifying a new source water for the Japanese Gardens Lake, Lake Balboa, and Wildlife Lake. Another important consideration concerning this option is the minimum flow needed for the LA River. Partial advanced treatment upgrade - For these options, partial (e.g. 25 percent, 50 percent, 75 percent) advanced treatment would be provided to maintain minimum flow to the Japanese Garden Lake, Lake Balboa and Wildlife Lake as well as other possible uses requiring very high quality effluent (e.g. indirect potable reuse). The rest of the flow would remain as recycled water meeting Title 22 requirements. TWRP would have two effluent streams: tertiary (Title 22) recycled water and advanced (MF/RO) discharge. These options could provide some treatment cost savings as well as maximizing recycled water production. However, they provide limited collection system and treatment relief.

Full advanced treatment upgrade – These options provide the greatest adaptability to changing regulations, influent flows, and end use of the effluent. However, these options will have the greatest treatment cost.





Figure 8-6
Tillman Water Reclamation Plant
Options: Ultimate Site Buildout Plan With Added Storage
(200 mgd with Advanced Treatment)

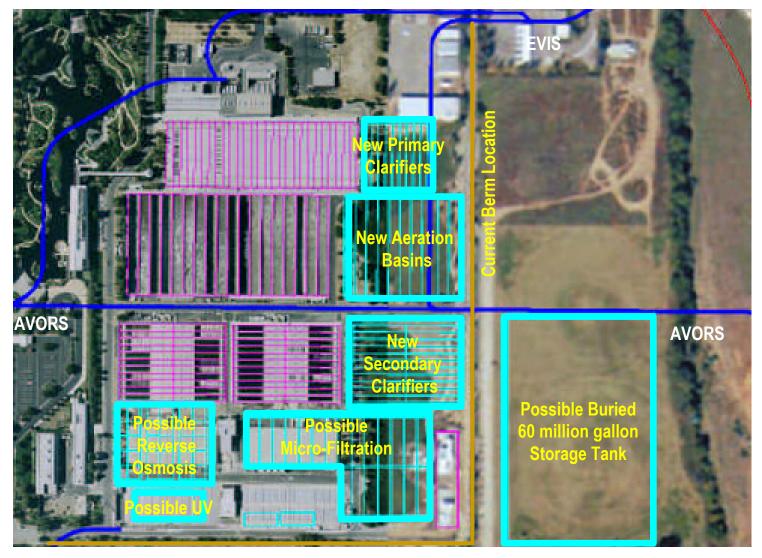


Figure 8-7
Tillman Water Reclamation Plant
Options: Expansion and Upgrade to 120 mgd With Added Storage

As discussed in Subsection 8.5.2, adding storage can help the facility provide collection system and treatment relief during PWWF. Storage can also be used to help a recycled water facility provide flow during peak demand as well as provide a more constant diurnal influent flow to the plant to help manage operations (operational storage). The addition of storage for one of these reasons is a suboption for each of the general options above.

Table 8-9 lists the general options which will be used to develop the integrated alternatives. Table 8-10 summarizes process upgrades needed for the general rated ADWF capacities.

Table 8-9 Tillman WRP Options for the Year 2020							
		Rated ADWF	Rated PWWF	Potential Recycled			
	Description	Capacity	Capacity	Water Produced***			
1A	No expansion or advanced treatment upgrade without operational storage	64 mgd*	0 mgd	64 mgd**			
1B	No expansion or advanced treatment upgrade with operational storage	64 mgd*	0 mgd	64 mgd			
2A	Partial advanced treatment upgrade without wet weather or operational storage	64 to 120 mgd*	27 to 90 mgd	51 to 92 mgd**			
2B	Partial advanced treatment upgrade with 60 mgd wet weather/ operational storage	64 to 120 mgd*	67 to 130 mgd	51 to 92 mgd			
ЗА	Full advanced treatment upgrade without wet weather or operational storage	64 to 120 mgd	64 to 120 mgd	51 to 92 mgd**			
3B	Full advanced treatment upgrade with 60 mgd wet weather/ operational storage	64 to 120 mgd	104 to 160 mgd	51 to 92± mgd****			

#### Notes:

<sup>\*</sup> Depending on the recycled water demand

<sup>\*\*</sup> Subject to diurnal constraints

<sup>\*\*\*</sup> After brine and waste sludge discharge

<sup>\*\*\*\*</sup> Could be more depending on operation of added storage

Table 8-10									
Tillman WRP Process Upgrades									
	Current ADWF Capacity	Upgrade to 64 mgd	Expansion and Upgrade to 80 mgd	Expansion and Upgrade to 100 mgd	Expansion and Upgrade to 120 mgd	Expansion and Partial Upgrade to 80 mgd			
Preliminary Treatment	180 mgd								
Primary Treatment	80 mgd			✓	✓				
Aeration Basins	80 mgd			✓	✓				
Secondary Clarifiers	64 mgd		✓	✓	✓	✓			
Filters*	80 mgd	From	From	From	Removed From Service**	In Service			
Advanced Treatment (MF/RO)	0 mgd	✓	✓	<b>✓</b>	✓	<b>√</b>			
Disinfection	80 mgd			✓	✓				

Notes:

# 8.6 Los Angeles-Glendale Water Reclamation Plant Options

#### 8.6.1 Introduction

As with other upstream plants, LAGWRP also must consider the same three factors: the projected year 2020 flow generated by the tributary area (including potential dry weather urban runoff diversion), the recycled water demand, and the environmental goals. This section will investigate and discuss options that will effectively deal with these factors.

# 8.6.2 LAGWRP Site Capacity and Constraints

The current ADWF capacity of LAGWRP is assumed to be 15 mgd, based on a 25 percent derating of the facility from the NdN improvements (see Subsection 7.4 for more information).

As with TWRP, the LAGWRP was designed for a treated average wet weather capacity of one and one-half times the ADWF. Hydraulically, the facility was designed for two times the ADWF. Should advanced treatment (such as MF/RO) be added, then the peaking ability of the plant is effectively removed.



<sup>\*</sup>This assumes that the existing filters are replaced to remove the current limitation

The tertiary filters are removed from service since the treatment is upgraded to MF/RO

Storage can be added to help regain some of this peaking capability lost due to the advanced treatment and will be sized the same as with TWRP. The current site will allow for a total of about 20 million gallons in storage (see Figure 8-8).

LAGWRP was designed to be built in phases. The smallest increment which will be investigated for this discussion will be 10 mgd. Table 8-11 summarizes the process capacities, dimensions, and the number of units in a 10 mgd phase.

Table 8-11 Los Angeles-Glendale WRP Processes						
Unit	Process	Capacity per Unit	Dimensions	Number of Units per 10 mgd Phase*		
Preliminary Treatment Bar Screens		30 mgd		1		
	Influent Pumps	25 mgd		1		
Primary Treatment	Primary Clarifiers	2.9 mgd	140' x 20' x 10.6' deep	4		
Secondary Treatment	Aeration Tanks	4 mgd	300' x 36' x 16' deep	3		
Secondary Clarifiers**		3.3 mgd	170' x 20' x 9.6' deep	3		
Tertiary Treatment	Filters	2 mgd	42' x 10'	5		
Advanced Treatment	Microfiltration Trains***	9.75 mgd	150' x 40'	1		
	Reverse Osmosis	5 mgd	40' x 45'	2		
Disinfection	Ultra-Violet	7.5 mgd	20' x 30'	2		

Notes:

This does not include any redundant units.

The ADWF buildout capacity of the current site is 50 mgd (see Figure 8-8). There is also a possibility of using land south of the current site that is owned by the City and currently used by the Recreation and Parks Department. Use of portion of this site could also lend itself to many multi-use opportunities.

<sup>\*\*</sup> The secondary clarifiers are based on the dimensions from the old HTP design.

<sup>\*\*\*</sup> Each microfiltration train contains 13 units.



Figure 8-8 Los Angeles-Glendale Water Reclamation Plant Options: Ultimate Site Buildout Plan with Added Storage

#### 8.6.3 LAGWRP Projected Year 2020 Flows and Demands

The projected year 2020 flows within the LAG Sewershed are 35 mgd ADWF (with average GWI), LAGWRP also has the option to receive flow from VSL/FA sewershed. The projected flow from the VSL/FA is 56 mgd for the ADWF and between 90 mgd to 160 mgd PWWF.

There is also a possibility of approximately 6 mgd of DWUR from the LAG sewershed and 7 mgd from the VSL/FA sewershed being diverted to LAGWRP as part of the Runoff Options (see the Runoff Management Volume for further discussion). Based on these projections the ADWF could range from 35 to 48 mgd. For this discussion, capacities ranging from 15 mgd to 50 mgd will be examined. Note that any excess flow above this will bypass the facility and be conveyed to HTP.

#### 8.6.4 LAGWRP Treatment Goals

As with TWRP, the environmental goals for LAGWRP depend on the end use: current Title 22 for recycled water, and advanced treatment for discharge to the LA River (see Subsection 3.5.2). To help simplify the options during the initial stages of alternative development, the advanced treatment will be provided by a combination MF and RO.

Note that the TM investigating the feasibility of using MBR with the RO instead of the MF (see Draft TM – Evaluation of MBR/RO Treatment at TWRP and LAGWRP, March 2, 2003) also looked at the addition of MBRs to LAGWRP. As with TWRP, the results of this study indicate that there could be potential cost and space savings associated with the use of MBRs. However, more testing will need to be completed before this is considered a viable option. Therefore, initial options analysis will focus on the MF/RO combination.

# 8.6.5 LAGWRP Assumptions Summary

The general assumptions used for the LAGWRP options are the following:

- Any discharge to the LA River requires advanced treatment.
- Assume brine disposal will be discharged to the sewer. Note that further study will be needed to determine the effects on HTP. A local or regional brine line will be considered as an alternate.
- Other recycled water applications must only meet current Title 22 requirements.
- Discharge limits will be the same for dry and wet weather at the upstream facilities. Note that currently they have a different limit for turbidity during storm events, which gives them the option to bypass the tertiary filters. However, all the other constituents in the 1998 NPDES Permit do not have different limits.
- Nitrification/ denitrification (NdN) conversion is considered existing situation.



- NdN conversion at LAGWRP will require derating by 25 percent.
- Waste sludge discharged back to sewer is assumed to be 5.8 percent of influent flow for LAGWRP. The sludge waste is based on historical information provided by the City.
- The assumed brine return rates are 10 percent for MF and 15 percent for RO.

# 8.6.6 LAGWRP Options

The three general options for LAGWRP are slightly different than for TWRP. They are as follows:

- No expansion or advanced treatment upgrade In this case, LAGWRP would become a recycled water plant only, providing little or no reliable treatment or flow relief (assuming discharge to the LA River requires advanced treatment). This option would still allow for recycled water production, while avoiding the large costs associated with upgrading to advanced treatment. Minimum flow needs for the LA River is a possible consideration with this option.
- Expansion and no advanced treatment upgrade For these options, LAGWRP would be expanded to maximize the recycled water output, but no advanced treatment would be provided. LAGWRP would still be a only a recycled water plant, providing little of no reliable treatment capacity or collection system relief.
- Full advanced treatment upgrade These options, whether expansions or not, provide the greatest adaptability to changing regulations, influent flows, and end use of the effluent. However, they will have the greatest treatment cost.

As discussed in Subsection 8.7.2, adding storage can help the facility provide collection system and treatment relief during PWWF. Storage can also be used to help a recycled water facility provide flow during peak demand as well as provide a more constant diurnal influent flow to the plant to help manage operations (operational storage). The addition of storage for one of these reasons is a suboption for each of the general options above.

Table 8-12 lists the general options which will be use to develop the integrated alternatives. Table 8-12 summarizes process upgrades needed for the general rated ADWF capacities.



	Table 8-12					
	Los Angeles-Glendale Water Reclamation Plant Options for the Year 2020					
			Rated			
		Rated ADWF	PWWF	Potential Recycled		
	Description	Capacity	Capacity	Water Produced***		
4.0	No expansion or advanced treatment	4.	0	4.5		
1A	upgrade without operational storage	15 mgd*	0 mgd	15 mgd**		
1B	No expansion or advanced treatment	4.5 a. a. a.*	0	45 marel		
18	upgrade with operational storage	15 mgd*	0 mgd	15 mgd		
	Expansion with no advanced treatment					
2A	upgrade without wet weather or operational	15 to 50 mgd*	0 mgd	15 to 50 mgd**		
storage						
	Expansion with no advanced treatment					
2B	upgrade with 20 mgd wet weather/	15 to 50 mgd*	0 mgd	15 to 50 mgd		
	operational storage					
3A	Full advanced treatment upgrade without wet	15 to 50 mad	15 to 50	11 to 26 mad**		
3A	weather or operational storage	15 to 50 mgd	mgd	11 to 36 mgd**		
3B	Full advanced treatment upgrade with 20	15 to 50 mad	28 to 63	11 to 26+ mad****		
38	mgd wet weather/ operational storage	15 to 50 mgd	mgd	11 to 36± mgd****		

#### Notes:

- \* Depending on the recycled water demand

  \*\* Subject to diurnal constraints

  \*\*\* After brine and waste sludge discharge

  \*\*\*\* Could be more depending on operation of added storage

	Table 8-13						
ı	Los Angeles-Glendale Water Reclamation Plant Process Upgrades						
	Current				Expansion	Expansion	
	ADWF	Upgrade to	Expansion	Expansion to	and Upgrade	and Upgrade	
	Capacity	15 mgd	20 mgd	50 mgd	to 20 mgd	to 50 mgd	
Preliminary	60 mad						
Treatment	60 mgd						
Primary	00 m m d			<b>√</b>		\ \	
Treatment	20 mgd			•		•	
Aeration Basins	20 mgd			✓		✓	
Secondary	4.C a. a.		1	1	<b>√</b>	1	
Clarifiers	15 mgd		•	•	•	V	
<b>□:</b> !*	20 E	Removed	In Comice	<b>✓</b>	Removed	Removed	
Filters*	29.5 mgd	From Service	In Service	•	From Service	From Service	
Advanced							
Treatment	0 mgd	<b>✓</b>		<b>✓</b>	✓	✓	
(MF/RO)							
Disinfection	32 mgd			<b>✓</b>	<b>√</b>	<b>✓</b>	
Note:	•					·	

\* This assumes that the existing filters are replaced to remove the current limitation



# 8.7 Terminal Island Treatment Plant (TITP) Options

The projected ADWF for the TITP sewershed is 19 mgd. Since the existing capacity of TITP is 30 mgd, there is no need to investigate expansion of the facility. However, TITP will require some replacement and upgrades of its existing facilities. There may also be a future need for wet weather storage at TITP. These will need to be addressed at a future time.

# 8.8 New Water Reclamation Plant Options

#### 8.8.1 Introduction

As with other upstream plants, a new facility must consider the same three factors: the projected year 2020 flow generated by the tributary area (including potential dry weather urban runoff diversion), the recycled water demand, and the environmental goals. However, with a new facility there is the added factor of physical location.

The purpose of this section to identify general wastewater requirements and assumptions used in determining the options for the new treatment facility size and location.

#### 8.8.2 New Water Reclamation Plant(s) (WRP) Potential Locations

Determining the location of a new WRP can be the most difficult part of building a new facility. The public has many concerns about living near a facility including: odor, noise, traffic, property values, safety, aesthetics, etc. One of the goals and challenges of the IRP Team is to use innovative technologies and multi-use approaches to help mitigate these concerns (see Subsection 8.9 for more information). Ultimately, we want people to look upon the facility as a benefit to their community.

#### 8.8.2.1 New WRP Site Criteria

In order to help with the process of evaluating a site and new WRP, the IRP team posed the question, "What criteria should be used in evaluating a new WRP?" to the Steering Group, the TAC and the MAC. Table 8-14 summarizes the resulting criteria.



Table 8-14				
	and Upgraded Facilities			
Category	Description			
Location	One and the state of the state			
Upstream VS. Downstream	Generally, if the facility is located in or near the San Fernando Valley			
Zoning/ Environmental Justice	Appropriate zoning on actual site and within surrounding area. Consider also environmental justice issues			
Not Using Existing Open Space	Preferred to not use existing open space for new facility location. Look for opportunities for better use of site or creating open space			
Low Cost				
Land Purchase	Cost of land acquisition			
Mitigation	Cost of mitigation for public acceptance (i.e. buried tanks, architectural treatments, etc.)			
Operational	Excessive pumping, accessibility issues, etc.			
High Beneficial Use of Water Resources				
Recycled Water Opportunities	Proximity to recycled water demands			
Runoff Treatment Opportunities	Ability to intercept dry weather urban runoff			
Multiple Benefits				
Recreational	Opportunity to include park, lake, wetlands, etc.			
Commercial	Opportunity to integrate with commercial possibilities for the site			
Educational	Opportunity for public education			
Inter-Agency/Inter-Project Opportunities	Opportunity for the integration with other agencies plans and projects (i.e. share costs, planning, etc.)			
Environmental	Opportunities to enhance the environment within Los Angeles			
Revitalization/ Redevelopment Opportunities	Opportunities to help revitalize and/or redevelop areas of Los Angeles			
Most Adaptable	In			
Site Location and Characteristics	Site would have flexibility to incorporate changes in flow, regulations, or technology. It would also allow for phasing			
Least Risk				
Technology	Tied to the site size. Smaller sites would need innovative processes to achieve same treatment capacity as larger sites			
Collection System Relief	Location helps to relieve collection system needs			
Site Characteristics	Includes seismic, flooding, etc.			
Environmental	Site does not have existing environment constraints or potential problems			
Project Implementation	Site has less environmental, regulatory, political, and public acceptance issues			
More Decentralized	L			
Site Location	Treats local flow and reuses it locally			



#### 8.8.2.2 New WRP General Site Locations

In developing the options for the new WRP, the location plays a key role in determining the relief to the wastewater system, potential recycled water demand, and potential dry weather urban runoff diversions. The process for determining the actual site of new plant will require a significant amount of time and input from stakeholders and the public. To start this process and provide some basis for identifying options, the IRP team has identified some general areas for new plant locations.

These locations are primarily for talking purposes at this point in the planning and based only on the proximity to collection system needs, recycled water demands, excess wastewater flow, and a discharge location (LA River). The other criteria will be evaluated during the alternatives analysis. The general locations are the following:

Valley Spring Lane/ Foreman Avenue (VSL/FA) – A new WRP in this location could help to relieve the collection system downstream (the tunnel). It could also help to provide recycled water to the central San Fernando Valley. It may even be connected to the TWRP and LAGWRP recycled water system to provide redundancy to the system.

■ *Downtown Southeast* – A new WRP in this area would primarily function to provide recycled water to the demands in the downtown area. It could be connected to

LAGWRP to help with any new recycled water demand.

■ Downtown West/Westside – A new WRP in this location would help to serve recycled water needs to the westside as well as possibly to downtown. It could help the collection system downstream, although much of the need is upstream of this area. Locating a place to discharge (other than returning to the sewer) from a plant may be difficult in this area. Figure 8-9 identifies these general areas.

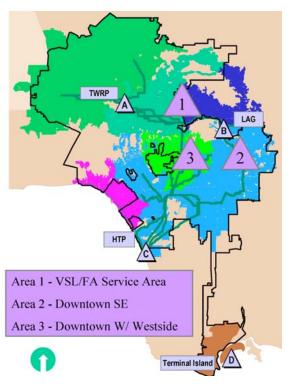


Figure 8-9
Initial General Areas for a New Water
Reclamation Plant



#### 8.8.3 New WRP Projected Year 2020 Flows and Demands

When identifying influent flow for a new WRP, there are four items to consider: quantity of influent flow available, recycled water reuse potential, effluent end use, and collection system constraints upstream or downstream of the facility.

The quantity of influent available is determined based on the upstream service area subtracting any flow treated by an upstream facility. The recycled water reuse potential is based on the amount of customers that can be served by the new WRP. This total quantity is separated into two tiers. The first tier is the larger demands, which can be served the easiest. In other words, the highest amount of reuse for the lowest cost.

The effluent end use is an important consideration. If a new WRP is designed as a recycled water plant only (no discharge to the LA River and hence no advanced treatment), then the size must match the recycled water demand more closely as any flow above that would be discharged back to the sewer anyway. If the new WRP will have a discharge then the plant would be sized more closely to the influent quantity available or downstream collection system needs.

Table 8-15 summarizes these considerations.

Table 8-15					
Considerations for Influent Flow to a New WRP for the General Areas					
Approximate Source Approximate Total Potential					
General Area Flow Recycled Water Demand					
VSL/FA Service Area	40 to 100 mgd	10 to 30 mgd			
Downtown Southeast	20 to 60 mgd	10 mgd			
Downtown West/ Westside	10 to100 mgd	10 to 20 mgd			

From these flows listed in Table 8-15, the range of source flows is significantly greater than the recycled water demands. Therefore, the options for the new WRP will consider influent flows from 10 to 60 mgd.

#### 8.8.4 New WRP Treatment Goals

As with TWRP and LAGWRP, the environmental goals for a new WRP depend on the end use: current Title 22 for recycled water, and advanced treatment for discharge to the LA River (see Subsection 3.5.2). To help simplify the options during the initial stages of alternative development, the advanced treatment will continue to be provided by a combination MF and RO. However, MBRs may be investigated during the integrated alternatives analysis.

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#### 8.8.5 New WRP Processes

For a new WRP the IRP team assumed that, as a minimum, it would provide preliminary treatment, primary treatment, secondary treatment, and tertiary treatment. For this discussion, these processes are modeled after the current treatment facilities.

As discussed earlier, advanced treatment may be needed depending upon location and whether the plant will be use only for meeting recycled water demands or will have a discharge. Again, for this discussion it is assumed that the advanced treatment will be MF/RO.

As with the other upstream facilities, storage for PWWF and operational storage will be considered. Also, it is assumed that ultra-violet (UV) disinfection will be used for any new facility. All new facilities will have odor control.

Assumptions for specific treatment process requirements are described in Table 8-16 below.

	Table 8-16				
	New Water Reclamation Plant Processes				
Treatment	Process	Description			
	Screening	Mechanically-raked barscreens; Magnetic flow meters			
Preliminary	Grit Removal	Grit hoppers; Grit pumps			
	Influent Pumping	Variable-speed and constant-speed pumps as required			
Primary Sedimentation Rectangular primary clarifier tanks		Rectangular primary clarifier tanks			
Primary Scum Removal Skimmers		Skimmers			
Flow Equalization		None required, may be installed for operational flexibility			
	Air Activated Sludge	Rectangular aeration tanks; RAS pumps; Process air blowers			
Secondary	Final Sedimentation	Rectangular clarifiers; RAS/WAS pumps			
	Nitrogen Removal	Nitrification/ denitrification			
	Coagulation	Aluminum sulfate storage tanks			
Tertiary	Filtration	Dual-media or sand filters; Filter feed pumps			
	Disinfection	Ultra-violet (UV)			
Advanced	Microfiltration	Membrane units similar to those in use at TITP			
Advanced	Reverse Osmosis	Membrane units similar to those in use at TITP			
	Effluent Discharge	Overflow weir structure; Discharge structure/pipe as required			
0.11	Solids Handling	None, discharge to HTP			
Other	Odor Control	As required			
	Storage	Underground concrete tank as required			



#### 8.8.6 New WRP General Layouts and Land Requirements

In order to meet the treatment requirements for flow projections, flows from 10 mgd to 60 mgd were used as options for the new treatment facility. Smaller facilities are also considered as part of Subsection 8.2 and could be considered in a programmatic solution.

The layout of a new treatment plant facility can vary greatly depending on the types of processes being used to provide the required level of treatment, wastewater storage requirements, site availability, and community concerns such as sound, aesthetics, odor, etc.

As an example a general layout for a 20 mgd secondary treatment plant with advanced MF/RO treatment is shown in Figure 8-10. The required area for this layout is about 8.5 acres of land. The acreage requirement will increase with the addition of wastewater storage tanks or solids handling process equipment. Table 8-17 provides estimates of land requirements for other sizes of new WRPs.

The required acreage may also be decreased significantly through the inception of innovative applications such as common wall construction, below ground construction, stacked sedimentation tanks, and deepened aeration tanks.

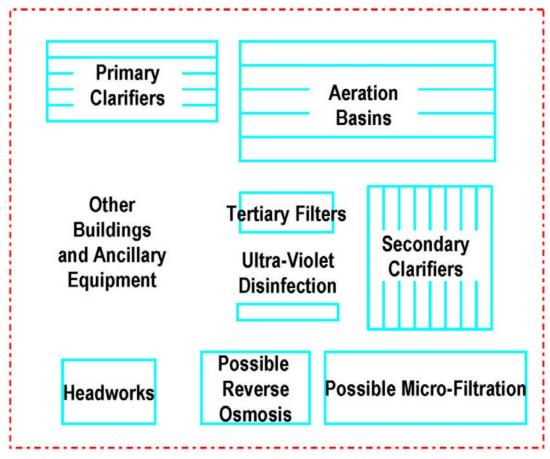


Figure 8-10 General Site Layout for a 20 mgd New Water Reclamation Plant

Table 8-17					
Estimated Land	Estimated Land Requirements for a New Water Reclamation Plant				
Area Needed for Tertiary Additional Area Needed for					
Rated ADWF Capacity	Treatment	Advanced Treatment			
10 mgd	4 acres	1 acres			
20 mgd	7 acres	1.5 acres			
40 mgd	12 acres	2 acres			
60 mgd	17 acres	3 acres			

Note:

These estimates are for the treatment processes only. They do not include area for storage tanks or for any multi-use additions

#### 8.8.7 New WRP Assumptions Summary

The general assumptions used for the new WRP options are the following:

- Any discharge to the LA River requires advanced treatment.
- Assume brine disposal will be discharged to the sewer. Note that further study will be needed to determine the effects on HTP. A local or regional brine line will be considered as an alternate.
- Other recycled water applications must only meet current Title 22 requirements.
- Discharge limits will be the same for dry and wet weather at the upstream facilities.
- Waste sludge discharged back to sewer is assumed to be 6.0 percent of influent flow for a new WRP.
- The assumed brine return rates are 10percent for MF and 15 percent for RO.

# 8.8.8 New WRP Options

The three general options for a new WRP are similar to the options for LAGWRP. They are as follows:

- No new WRP In this case, the existing facilities would be upgraded and/or expanded to meet the Year 2020 flows.
- New WRP with no advanced treatment For these options, a new WRP would be designed to maximize the recycled water output, but no advanced treatment would be provided. The new WRP would be a only a recycled water plant, providing little of no reliable treatment capacity or collection system relief.
- New WRP with full advanced treatment These options provide the greatest adaptability to changing regulations, influent flows, and end use of the effluent. However, they will have the greatest treatment cost. These will also provide the greatest possible benefit to the collection system.



As discussed in Subsection 8.7.2, adding storage can help a new WRP provide additional collection system and treatment relief during PWWF. Storage can also be used to help a recycled water facility provide flow during peak demand as well as provide a more constant diurnal influent flow to the plant to help manage operations (operational storage). The addition of storage for one of these reasons is a suboption for each of the general options above.

Table 8-18 lists the general options which will be use to develop the integrated alternatives.

	Table 8-18						
	New Water Reclamation Plant Options for the Year 2020						
				Potential			
		Rated ADWF	Rated PWWF	Recycled Water			
	Description	Capacity	Capacity	Produced***			
1A	No new WRP	0 mgd	0 mgd	0 mgd			
New WRP with no advanced treatment and		10 to 60 mgd*	0 mad	9.4 to 56 mgd**			
ZA	without wet weather or operational storage	TO to 60 mga	0 mgd	9.4 to 56 mga			
2B	New WRP with no advanced treatment	10 to 60 mgd*	0 mgd	9.4 to 56 mgd			
	upgrade with wet weather/ operational storage	To to oo mga	o nigu	9.4 to 50 mga			
New WRP with full advanced treatment and		10 to 60 mgd	10 to 60 mgd	7 to 42 mgd**			
	without wet weather or operational storage	10 to 60 mga	10 to 60 mga	7 to 42 mga			
3B	New WRP with full advanced treatment and	10 to 60 mgd	17 to 73 mgd	7 to 42± mgd****			
	wet weather/ operational storage	TO to do rriga	17 to 73 mga	7 to 42± mga			

#### Notes:

- \* Depending primarily on the recycled water demand
- \*\* Subject to diurnal constraints
- \*\* After brine and waste sludge discharge
- \*\*\* Could be more depending on operation of added storage

# 8.9 Innovative Multi-Use Treatment Opportunities 8.9.1 Introduction

The results of the IRP planning effort may ultimately recommend new treatment facilities, or upgrades and expansions to the existing facilities. In all cases, innovative technologies and multi-use site benefits can be incorporated within the plan, providing added community benefit and increased efficiency.

#### 8.9.2 Multi-Use Treatment Facilities

Multi-use treatment facilities provide innovative applications to effectively manage the challenges of locating a new wastewater treatment facility or upgrading an existing facility. Some of these challenges might include site location, process requirements for the desired level of treatment, and community concerns toward sound, aesthetics, odor, etc. Multi-use facilities are an effective means to mitigate the community concerns by providing the community with an aesthetically pleasing facility, which also may be used by the community for other activities.



Specifically, multi-use facilities are ones in which the site has other uses or benefits to the community besides the primary use of treatment. An example of this is the Japanese Garden at TWRP. TWRP is located in the northern area of the City in the San Fernando Valley. The facility is situated within the Sepulveda Dam Recreation Area, which provides valuable open space and recreational opportunities for the surrounding community. The plant was designed by the City of Los Angeles, Department of Public Works and DMJM to incorporate treatment and water reuse with great architecture, public spaces, and natural beauty. The facility itself is generously landscaped, and includes a 6.5 acre Japanese Garden which provides a wonderful area for the public to enjoy. The Japanese Gardens includes a teahouse, a Shoin building, a lake, bridges, and a variety of ornamental trees, shrubs and flowers. Trees and berms help to screen other parts of the facility from visitors to the adjacent recreational areas. The control building, which also acts as a visitors center for the Japanese Garden, is architecturally stunning. TWRP also provides recycled water for other lakes within the basin.

While the innovative additions at TWRP are a good example of onsite benefits, this does not necessarily mean that benefit can not be located away from the site. An example would be to build a new park within the community with a water resources education center, with all the irrigation provided by recycled water from the facility.

The concept of multi-use facilities is not new. Many treatment facilities throughout the world have been using innovative technologies and construction practices to help minimize the impacts of new and expanded facilities to the community. As part of the IRP, a TM was prepared to discuss some of these facilities. The TM is titled "Innovative Multi-Use Treatment Facilities" (CH:CDM, May 2003). Other examples of existing multi-use facilities include treatment plants integrated with a sports complex, recreational parkland, marine and river parks, historic buildings, and education and business centers.

All of these examples should be considered as additions to any options developed for upgrading or expanding existing facilities and for a new treatment facility as a means to provide additional enhancement to the community. Based on feedback from the IRP Public Stakeholders (i.e. Steering Group), the IRP team is assuming that every major upgrade or expansion at an existing or new facility must incorporate multi-use site benefits.



# Section 9 Biosolids Management

#### 9.1 Introduction

This section considers the management of the biosolids produced in the wastewater treatment process. In recent years, there have been increasing public perception and regulatory issues associated with biosolids that have brought solids management to the forefront. A number of factors have led to increasing public concerns with land application of biosolids in California. Due to local pressures a number of counties have implemented or are considering implementation of regulations restricting or banning land application of biosolids. The aims for the biosolids management evaluation task include the following:

- Provide sustainable 20-year planning direction
- Evaluate biosolids markets and technologies
- Consider biosolids management options that may be suitable for the City to own/operate or for private vendors to operate

The approach used for conducting this task is depicted in Figure 9-1. First, the existing biosolids management situation was reviewed, including an analysis of drivers, current biosolids production and quality and current management contracts. Following this, the available technologies for creating biosolids products were reviewed in parallel with the markets for these products. This then led to development of the recommended planning direction and associated cost projections and identification of potential triggers for change. The recommended strategy aims to assist in providing direction for future biosolids management by the City in a manner that meets the goals and objectives of the City's Biosolids Environmental Management System (EMS) and outlined in this task.

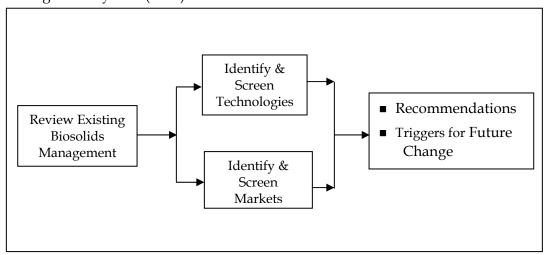


Figure 9-1 Biosolids Management Task Approach



#### 9.1.1 Importance of Considering Biosolids in IRP

The City is one of three large wastewater treatment agencies in the Los Angeles/Orange County area, along with the Los Angeles County Sanitation District (LACSD) and the Orange County Sanitation District (OCSD). These large agencies have a high profile in Southern California regarding their biosolids management practices. Having three large agencies within the same region of Southern California has led to a large volume of biosolids being land applied within a few of the more rural counties, in particular, Kern, Kings, and Riverside Counties. All three counties are now implementing restrictions on land application of biosolids, as will be discussed below. Other rural counties in the area, such as San Bernardino and Imperial counties have actual or practical bans on land application of biosolids.

Due to the increasing restrictions in Southern California, several agencies, including the City and OCSD, have contracted to land apply biosolids in Arizona. Until recently biosolids from the City were being land applied in Maricopa County, Arizona. Nearby in La Paz County, the County supervisors recently decided to be the first county in Arizona to introduce a local ordinance on land application of biosolids. Other counties in Arizona may follow, especially as California increases the amount of biosolids being land applied there, which could raise the profile of this issue. These restrictions have not been based on science, but on perceptions.

As a leading agency in Southern California, effective biosolids management is necessary to maintain a positive perception of the City, within the City, in Southern California, and with the regulatory bodies involved with biosolids. Realizing the importance of biosolids management, the City was one of the first agencies nationally to take part in developing and implementing a Biosolids EMS. The City was also one of the first in Southern California to move toward improving the quality of biosolids, discussed below. However, as the EMS recognizes, effective management requires an on-going, proactive approach. Therefore, any long term plan, such as the City's IRP, needs to consider the direction for biosolids management to ensure that the City has in place effective options for the near term and the long term. The drivers that need to be considered when examining biosolids management options are discussed below.

# 9.1.2 Biosolids Management Goals

Several environmental goals were identified to guide the development of a sustainable biosolids management program. These goals are based on the City's Biosolids EMS as follows:

- Management should be in line with the Biosolids EMS
- Comply with all regulations, federal, state and local
- Provide good stewardship of resources both biosolids and finances



- Maximize the reliability of the long-term biosolids management program
- Improve public perception and confidence
- Realize innovative, cost-effective & environmentally sound ideas
- Provide multiple processing options
- Maintain in-basin management options
- Continued use of private sector hauling and land application
- Diversify markets
- Identify and maintain back-up options

# 9.2 Drivers Affecting Biosolids Management

There are three key drivers that affect biosolids management – regulations, public perception, and product market options. These drivers are interrelated, because public perception is often a catalyst for regulation, particularly at the local level, and local regulations can impact the biosolids beneficial use market options. These factors impact cost, viability of management options, reliability and the need for diversification, all of which drive new technology options.

# 9.2.1 Regulations

The main regulation that governs the treatment and beneficial use of biosolids is the federal regulation, 40 Code of Federal Regulations (CFR) Part 503 (Part 503 Regulations). In Southern California, most solids handling has consisted of anaerobic digestion at mesophilic temperatures ( $\approx 98^{\circ}$ F) to provide stabilization and pathogen reduction in the solids, followed by dewatering for volume reduction. This process generally achieves a "Class B" biosolids as defined by the Part 503 Regulations.

The City has implemented thermophilic digestion ( $\approx 128^{\circ}$ F), achieving "Class A" pathogen densities and producing EQ (exceptional quality) biosolids, as defined in the Part 503 regulations for pathogens, metals and vector attraction reduction. After dewatering, the digested "cake" that meets the Part 503 regulation requirements is suitable for recycling and is termed "biosolids" as the solids are in a form that can be transported for beneficial use, typically through land application of the biosolids.

The recently completed National Academy of Science (NAS) report on biosolids stated that there is no documented evidence of the Part 503 regulations failing to protect public health or the environment. It also stated that the scientific basis for the Part 503 regulations must be updated. However, in some instances the report has been used negatively, has affected public perception of land application of biosolids and, in the case of Riverside County, and increased the pressure for restrictions on land application of biosolids.



The Part 503 regulations allow local jurisdictions to implement more stringent requirements. Although the State of California uses the Part 503 regulations as its foundation for the state regulations, counties are allowed to impose more restrictions on biosolids beneficial use than provided in the federal or state regulations. Several counties in California have done so using several methods, including the following:

- Banning land application of biosolids
- Imposing restrictive requirements on the quality of biosolids
- Limiting the area that can be used for land application
- Levying local charges such as road use fees.

Neither the State nor the counties are required to provide a science-based approach to biosolids regulations. Therefore, this trend makes land application of biosolids increasingly tenuous. The City's Green Acres Farm is located in Kern County, which has banned the use of Class B biosolids. There are also concerns by Kern Water Agency and some farming sectors with regard to the use of any biosolids over useable ground water and this has been brought to the attention of the county's Water Resources Commission and Board of Supervisors.

Air quality is also a key concern in Southern California and is highly regulated. Any biosolids processing technologies installed at the City's wastewater treatment plants will need to maintain emissions below the levels currently allowed in the City's air quality permits. Any off-site installations, whether owned by a private entity or a public agency, will need to obtain air quality permits. The Rule 1133 regulation was adopted by the Southern California Air Quality Management District (SCAQMD) in January 2003 regarding air quality impacts of composting facilities. In its present form, Rule 1133, is emissions-based rather than control-technology based - facilities must demonstrate significant reduction of volatile organic compounds (VOCs) and ammonia emissions from baseline emissions values. Alternatively, a complete enclosure can be installed and collected air treated using a control device that demonstrates adequate removal efficiency.

These are the key regulatory issues that need to be considered when evaluating the applicability of biosolids processing technologies for the City and Southern California. A more extensive list of current and future regulations that may impact biosolids management and processing facilities is provided in Appendix J. As newer biosolids technologies become more commonly used, it is possible new regulations may be developed in response to new issues that arise. Therefore, the technology evaluation must consider aspects that may be a trigger for additional legislation, such as odors, metal concentrations and air emissions.



## 9.2.2 Public Perception

Much of the drive behind implementing restrictive county land application ordinances has been public perception. Issues that impact public perception of a facility include odor, traffic and visual appearance of the facility and facility siting (NIMBY), in addition to previous negative attitudes to any project involving solids disposal. Odor and aesthetics of the biosolids have been key issues influencing public perception and have lead to questions about the health impacts and pathogen levels in the biosolids. Therefore, a goal is to identify technologies that provide a product that is more likely to be sustainable over the long-term. The resulting product should have the following attributes:

- Free of objectionable odor
- An aesthetically pleasing biosolids product that does not contain plastics or other large objects
- A product amenable to alternative beneficial use options

## 9.2.3 Product Market Options

Biosolids use in Southern California has largely been limited to land application of biosolids with Class B pathogen levels and some marketing of EQ biosolids compost. Recent restrictive regulation by counties has reduced the availability of Class B land application sites throughout California. Although there are opportunities for Class B land application in other states such as Arizona and Nevada, increased land application in these states may result in public opposition and legislation similar to what has occurred in California. Composting facilities have also experienced public opposition, primarily due to odors at the composting facilities themselves. In addition, more stringent air quality regulations have been adopted to control VOC and ammonia emissions from composting operations. These changes indicate that the biosolids processing technologies must be compatible with the market options and that new markets must be identified to provide a diverse range of recycling options for sustainable biosolids management. Technologies providing products with a long-term market demand and multiple market options will be considered preferable.

# 9.3 Existing Biosolids Quality

The City has four wastewater treatment plants, of which two, the Donald C. Tillman Water Reclamation Plant (TWRP) and the Los Angeles-Glendale Water Reclamation Plant (LAGWRP), do not have any solids treatment. Those two plants return the solids to the sewer, with the flows entering the Hyperion Treatment Plant (HTP).

HTP provides thermophilic digestion of the solids generated at the plant, and produces biosolids that meet the Part 503 regulations' EQ standards for pathogens, metals and vector attraction. The plant currently produces approximately 680 wet tons per day (wtpd) of dewatered biosolids, with a solids content of about 32 percent.



The City also operates the Terminal Island Treatment Plant (TITP), which receives wastewater flows from the San Pedro area and Terminal Island. The plant also has thermophilic digestion and the biosolids meet EQ standards.

Biosolids from both HTP and TITP are land applied. EQ biosolids that meet Kern County's pathogen requirement for both salmonella and fecal coliforms and meet Class A pathogen densities at the time of spreading may be applied at the City's Green Acres Farm. Although it is expected that the land application of EQ biosolids will continue to be allowed in Kern County, the trend in local ordinances is toward increasing restrictions. Until recently, biosolids from TITP had been hauled to land application sites in Maricopa County, Arizona, by Synagro (formerly BioGro).

## 9.3.1 Hyperion Treatment Plant Biosolids

Table 9-1 summarizes the regulatory standards for metal concentrations, and provides the average, minimum and maximum concentration of those metals in the biosolids produced at the HTP during the 12-month period from December 2001 to November 2002. As shown in Table 9-1, the metal concentrations in the biosolids produced from the HTP plant are well below the regulatory standards for the metals. As noted in the table, the United States Environmental Protection Agency (EPA) recently decided not to regulate dioxins under the Part 503 regulations. The levels of radioactivity in the City's biosolids are low and should not be a concern affecting beneficial uses.

The biosolids from HTP are regularly tested for fecal coliforms and salmonella, as indicator species for pathogens. The biosolids from the thermophilic digestion process meets both standards for Class A biosolids, with fecal coliforms <1000 MPN per dry gram of solids, and salmonella <3 MPN per 4 dry grams of solids. The biosolids are tested for helminth ova and enteric viruses and consistently are below the limit of 1 unit per 4 dry grams. As the biosolids meet the pathogen, vector attraction and metal concentration requirements, the biosolids are termed EQ. Under the Kern County biosolids ordinance, the biosolids should meet both fecal coliform and salmonella Class A pathogen criteria at the time of land application.

Since implementation of thermophilic digestion for all solids produced at HTP, the volatile solids destruction is around 59 percent and the dewatered cake has a solids content of around 32 percent.

#### 9.3.2 Terminal Island Treatment Plant Biosolids

Table 9-2 summarizes the regulatory standards for metal concentrations, and provides the average, minimum and maximum concentration of those metals in the biosolids produced at the TITP during the 12-month period from December 2001 to November 2002.



Table 9-1						
Regulatory Standards vs. HTP Biosolids Quality Data						
	Current/Proposed Regulatory Standards <sup>(a)</sup>		Plant Data for 2001-2002			
	Ceiling	Ceiling Pollutant				
Constituent/Parameter	Concentration	Concentration	Minimum	Maximum	Average	
Arsenic (mg/kg)	75	41	2.02	13.7	7.66	
Cadmium (mg/kg)	85	39	9	26.9	14.8	
Copper (mg/kg)	4300	1500	743	997	847	
Lead (mg/kg)	840	300	29.6	50.8	39.4	
Mercury (mg/kg)	57	17	1.09	3.62	2.34	
Molybdenum <sup>(b)</sup> (mg/kg)	75	-	17	30.2	22.9	
Nickel (mg/kg)	420	420	65.8	108	83.1	
Selenium (mg/kg)	100	100	0.6	19	8.03	
Zinc (mg/kg)	7500	2800	932	1180	1050	
Dioxins (c)		NA	<11 ppt	<84 ppt	<35 ppt	

#### Notes:

- 1. Based on Part 503.13 ceiling concentrations (Table 1) & average concentrations (Table 2)
- 2. A new concentration limit and cumulative pollutant loading rate may be introduced in the future
- 3. EPA has decided not to regulate dioxins in biosolids, proposed limit had been 300 ppt TEQ

Table 9-2						
Regulatory Standards vs. TITP Biosolids Concentrations for Metals  Current/Proposed Regulatory						
	_	lards <sup>(a)</sup>	Plan	t Data for 2001-2	2002	
	Ceiling	Pollutant				
Constituent/Parameter	Concentration	Concentration	Minimum	Maximum	Average	
Arsenic (mg/kg)	75	41	1.87	13.3	7.03	
Cadmium (mg/kg)	85	39	0.62	3.28	1.92	
Copper (mg/kg)	4300	1500	208	355	289	
Lead (mg/kg)	840	300	5	63	33.5	
Mercury (mg/kg)	57	17	1.02	3.32	2.09	
Molybdenum <sup>(b)</sup> (mg/kg)	75	-	15.8	23.6	19	
Nickel (mg/kg)	420	420	32.4	57.2	41.6	
Selenium (mg/kg)	100	100	31.5	83.4	56.6	
Zinc (mg/kg)	7500	2800	469	890	736	
Dioxins (c)		NA	<11 ppt	<84 ppt	<35 ppt	

#### Notes:

- (a) Based on Part 503.13 ceiling concentrations (Table 1) & average concentrations (Table 2)
- (b) A new concentration limit and cumulative pollutant loading rate may be introduced in the future
- (c) EPA has decided not to regulate dioxins in biosolids, proposed limit had been 300 ppt TEQ



As shown in Table 9-2, the metal concentrations in the biosolids produced from TITP are well below the regulatory standards for the metals. In past years, the plant had experienced elevated levels of zinc, molybdenum, copper, and selenium. The City's Industrial Waste Management Division worked with the local industrial dischargers to reduce these discharges.

The biosolids from TITP are regularly tested for fecal coliforms and salmonella, as indicator species for pathogens. The biosolids from the thermophilic digestion process meets both standards for Class A biosolids, with fecal coliforms <1000 MPN per dry gram of solids, and salmonella <3 MPN per 4 dry grams of solids. The biosolids are also tested for helminth ova and enteric viruses and consistently are below the limit of 1 unit per 4 dry grams.

For the 12 month period ending June 2002, volatile solids destruction in the digesters averaged 51 percent, with the hydraulic detention time for the three operational digesters ranging from 16 to 23 days.

## 9.4 Solids Production

A summary of the current and projected biosolids production at the HTP and TITP treatment plants is provided in Table 9-3. These estimates are based on the wastewater treatment modeling task, detailed in Section 7, with a correction factor applied to the HTP final cake volume, as per a memo dated February 27, 2004 (see Appendix I). TITP flows and solids production are not anticipated to increase significantly by 2020. However, the flows and solids production at HTP are expected to increase around 26 percent, from 681 wtpd to 861 wtpd. This is based on continuing the current biosolids handling practices, with upstream plants returning solids to the sewer system to the HTP influent, and with continued thermophilic digestion and centrifuge dewatering at HTP.

Table 9-3 Current and Projected Biosolids Production						
Current Capacity 2020 Projections						
	HTP TITP					
Parameter	Rated	Operational	Rated	Operational	HTP	TITP
Flow, MGD (annual average)	450	335	30	17	450	19
Biosolids, dtpd	-	217	-	11	275	12
Solids concentration %	-	32	-	22	32	22
Dewatered biosolids wtpd - 681 - 50 861 56						
Note: HTP data presented are base	ed on the Pro	2D modeling with	n biosolids	correction factor	r. TITP data f	rom plant sta

Primary and secondary treatment options at the different wastewater treatment plants will effect the volume and characteristics of the solids produced. Chemically enhanced primary sedimentation produces a greater amount of primary solids and reduces the amount of secondary solids produced. Primary solids are more easily biodegradable in the digestion process and typically improve dewaterability. In contrast, secondary solids are less easily digested and reduce the dewaterability of the



digested solids. Process changes that impact the ratio of primary to secondary solids will therefore have impacts on the biosolids quantity and quality. For instance, biological nutrient removal processes tend to produce fewer secondary solids than conventional activated sludge processes and would therefore have a positive impact on biosolids handling.

Although there are no process changes proposed to digestion or dewatering, if alternate processes are considered in the future, they could have an impact on biosolids management options and costs. If enhanced digestion, such as thermophilic digestion or alternative options is discontinued, it is likely that dewatered cake dryness will drop, which will increase the total weight of biosolids produced. Changes to the dewatering process technology could also impact the total weight of biosolids. Belt press dewatering typically will not produce as dry a cake as centrifuge dewatering, although there are two-stage dewatering processes now being offered by some suppliers, such as Andritz, that could produce a drier material. Other technologies, such as vacuum and heat assisted dewatering are also available, which could produce a drier cake of around 60 percent solids content. These have not been implemented at a large scale plant like HTP. Future changes to the solids handling process may therefore change the volume of biosolids and therefore the total cost of managing the biosolids would be impacted.

Increasing the dryness of the cake would reduce the cost associated with a number of the biosolids product technologies, such as heat drying and composting. Note that it is important to avoid producing biosolids that have a solids content in the range from 35 to 40 percent. Biosolids with a solids content in this range tend to be "sticky", which creates material handling problems. Conversely a reduction in the cake dryness will increase the cost of many of the product technologies.

Although changes in the weight of biosolids and characteristics may impact the total biosolids management program costs and may impact the cost of different technology options, the City will continue to produce a large amount of biosolids. The actual amount is not likely to affect the recommended biosolids management strategy. It is important to maintain the highest quality of biosolids processing, so that the marketability of the final products is maintained. This includes continuation of effective screening at the wastewater treatment plants to reduce the presence of non-biodegradable materials in the biosolids, and continuation of an effective digestion process that produces stable biosolids.

# 9.5 Current Biosolids Management Options

This section provides a brief review of the current biosolids management options for the City. These are primarily based on existing contracts, supplemented by proposals received by the City in reply to various biosolids management Request for Proposals (RFPs) that were issued in recent years. Technologies received in the proposals were included in the evaluation of a wide range of biosolids product technologies, as described in Subsection 9.7.



#### 9.5.1 Existing Biosolids Management Contracts and Markets

Currently, the City contracts with Responsible Biosolids Management Inc. (RBM) to haul and land apply biosolids at the City's Green Acres Farm. They recently terminated the contract with Synagro for land application at other sites. The existing 10-year contract with RBM commenced in September 2000 and requires the City to provide a minimum of 547 wtpd for hauling, at the cost of \$23.44/wet ton.

The City recently received proposals in response to a Request for Proposals (RFP) for operation of the Green Acres Farm. The new contract will be for a three-year term. Management has been conducted by Fanucchi Brothers Farming on an interim basis. The City also intends to hire a farm manager as a City employee to oversee activities and contractors at the farm.

## 9.5.2 On-file Biosolids Management Proposals

The City issued three RFPs during the year 2001 for processing biosolids produced at the HTP and/or the TITP that meet the Class B pathogen and vector attraction reductions requirements and metals standards for beneficial use in accordance with the Part 503 regulations. The RFPs were for private contractor facilities including biosolids drying operations, generation of Class A biosolids products and management of Class B biosolids.

Contracts awarded under these RFPs would supplement as practically as possible the biosolids beneficial recycling contracts that were already in place. As part of the complete system, proposers were to define the development and financing using a full-service contract approach, with the proposer bearing all costs of the design, permitting, financing, construction and operation of the system. It was intended that the process be developed in an environmentally and economically sound manner. The contract term for each RFP was to be for a period of three years. There would be two three-year renewal options available, pending appropriate approval.

In response to the RFPs listed above, the City received proposals from sixteen companies. A panel of City staff was set up to review the proposals that passed the City's Good Faith Effort requirement and a number of proposers were interviewed by the panel. Proposals that were reviewed included California Soils Products, Hondo Chemical, Transnational Environmental Corporation/N-Viro, US Filter/Professional Services Group and Waste Markets for chemical stabilization, Minergy for vitrification, San Joaquin Composting for composting and land application, Synagro for composting, Terralog Technologies for slurry fracture injection for energy recovery and TPS Technologies for composting and drying. Following the review, the City entered into discussions with Terralog Technologies to further consider the feasibility of slurry fracture injection for energy recovery. This has led to development of the Terminal Island Renewable Energy (TIRE) project, to conduct testing of this new application of the technology.



#### 9.5.3 Summary of Other Western U.S. Practices

Within California, there is increasing pressure on land application, particularly of Class B biosolids. In response to this, many agencies are considering methods of producing Class A biosolids, as well as diversification of the biosolids product markets, to reduce the dependency on land application routes. Table 9-4 summarizes the direction being considered by some of the agencies in Southern California. It must be noted that most agencies are at different stages in developing biosolids management plans in response to the current regulatory climate, and that the summaries provided in Table 9-4 are subject to change. Composting and pelletization appear to be considered the most favored options for agency-owned biosolids processing facilities, and allow diversification of the product away from land application. In addition, there are a number of private facilities being proposed in Southern California, and there is increasing interest in options for energy and fuel recovery, as an alternative to the cropping market options such as land application and horticulture.

Table 9-4				
Direction of Biosolids Management in Southern California <sup>1</sup>				
Agency	<b>Biosolids Management Direction (Tentative)</b>			
Los Angeles County Sanitation District (LACSD)	Composting at various potential locations			
Orange County Sanitation District	Diversified, considering composting, drying, energy			
City of San Diego	Landfilling			
Inland Empire Utilities Agency	Composting, on-site (joint facility with LACSD)			
City of Riverside	Regional pyrolysis facility			
City of Corona	Thermal Drying (pellets), on-site			
Encina	Thermal Drying (pellets), on-site			
San Bernardino	Thermal Drying (pellets), on-site or regional			
Santa Barbara County	Composting, in-county			
Note:	·			
<sup>1</sup> As of April 2004.				

# 9.6 Evaluation of Biosolids Markets

A number of biosolids markets were identified, which are compatible with the range of products available from the biosolids processing technologies described in the next subsection. Nine cropping markets and eight non-cropping markets were identified. Table 9-5 shows the viable technologies identified in the pre-screening step (Subsection 9.7) and the related products from these technologies. Table 9-6 shows the markets available for the different biosolids products. Brief descriptions of the markets are provided below, followed by a summary of key aspects of the different markets, such as legal restrictions, market size and public perception.



				Table 9-5								
Viable Product Technologies Related to Biosolids Products												
Products			Alkaline Stabilized Products				Non-	Fuel Products				
		Dry Pellets			Chemical	Construction	Construction	/Energy	EQ			
Technologies	Compost	& Granules	pH >11	pH ≈ 7	Fertilizer	Materials	Materials	Recovery	Cake			
Composting	Х											
Heat Drying		X			(X)*	(X)*		X				
Chemical Treatment			X	X	Χ							
Pyrolysis								Х				
Super Critical Water Oxidation						X	Χ	X				
Gasification								X				
Combustion						Х	Х	Х				
Renewable Energy Recovery								Х				
Thermophilic Digestion									Х			
Nice		•										

Note:

\* with additional processing or blending



	Diago.		able 9-6	- 14! -	-4-				
Products  Markets	Compost	Dry Pellets	•		Chemical	Construction Materials	Non- construction materials	Fuel Products/ Energy Recovery	EQ Cake
Cropping Markets	- Compost	G. Granaios	pii i			- matorialo	materiale	receiving	
Land Application for Non-food crops									Х
Land Application at City Farm, EQ biosolids	X	Х		Χ	Χ				X
Horticulture - City Uses	Х	Х		Χ					<u> </u>
Horticulture – ornamental & nursery	X	Х		Χ	Χ				1
Horticulture – blending & bagging for retail	X	Х		Χ	Χ				1
Silviculture – Shade Tree Program	Х	Х		Χ	Х				<u> </u>
Biomass/Ethanol crops	X	Х		Χ	Χ				Х
Citrus, avocado, vineyard & orchard		Х			Χ				<u> </u>
Ag-Lime Applications			Х						<u> </u>
Non-Cropping Markets									<u> </u>
Direct Energy		Х						Х	X
Erosion Control	X								<u> </u>
Direct Landfilling		Х				Х	X	Х	X
Landfill Partnering – Daily Cover	X	(X)*	Х	Χ					(X)
Construction Market		(X)*				Х			
Non-construction Market							Х		 
Dedicated Land Disposal		Х				Х	Χ	Х	Х
Fuel usage		Х						Х	Х
Note:				·					

\* requires further processing or blending



## 9.6.1 Land Application for Non-food Crops

A common biosolids market is spreading on land used to grow non-food crops. The decision to use biosolids only on non-food crops is not based on regulation, but on a decision by the City in recognition of the sensitivity of the food industry to public perception of food safety. Land application of biosolids has many documented benefits, including provision of slow-release organic nutrients, improvements in water retention and soil structure. Recently in Virginia there was a move to ban biosolids land application, which was overturned due to support from the farming community for biosolids land application. However, in Southern California many counties have moved to ban land application of Class B biosolids. Kings County has an ordinance that bans land application of any biosolids except compost from 2006. Other counties have considered similar ordinances. Riverside is implementing an ordinance that classifies EQ biosolids into three tiers, with different restrictions for each tier. Although it appears that at present Kern County and Riverside County will not ban EQ biosolids, the trend is towards increasing restriction on land application. Public perception issues and political constraints need to continue to be managed to enable use of land application into the future.

## 9.6.2 Land Application at City Farm

Land application of EQ thermophilically digested biosolids for non-food crops at the City's Green Acres Farm in Kern County has been a cost-effective management option. The City has been working with Kern County to maintain the option to beneficially use biosolids at the Green Acres Farm. The ability of the county to regulate land application means this market is not guaranteed, although public outreach and good stewardship by the City can be used to showcase the farm as a beneficial use of resources. Land application has been witnessed by the two newest Supervisors, who commented that the neighboring dairy smelled, but not the City's farm. However, issues being raised by the Kern Water Agency and some in the farming community with regard to the use of biosolids over useable groundwater will need to be addressed. Maintaining good management practices and documentation, as per the City's Biosolids EMS, will assist in supporting the science and benefits of land application of biosolids.

# 9.6.3 Horticulture- Blending & Bagging For Retail

This market involves producing considers the potential for compost and dried products for use in retail blending and bagging operations. The benefits of using organic residuals, such as compost and dried products, to amend soils and improve growth of crops are numerous and well documented. Thirty-six facilities produce over 1.6 million tons per year of compost products throughout southern California. These companies take in over 2.5 million tons per year of raw material that is processed into these products.

In the southern California marketplace, four suppliers dominate sales at the retail level. Kellogg Garden Products, Scott's Hyponex, Western Organics, and Whitney Farms control the majority of shelf space. The City has not had success in working



with compost wholesalers in the past. The products are sold in displays featuring the products as topsoil or soil amendments. A total of eleven compost product manufacturers and suppliers are known to be operating in the local retail marketplace. Several of these manufacturers supply products to K-Mart, Target, and Wal-Mart for their own in-house promotion and brand. Of these manufacturers, three firms, Kellogg Garden Products, Western Organics, and Scott's Hyponex, utilize biosolids in their product formulations.

The biosolids portion of the Southern California marketplace appears to be dominated by Kellogg Garden Products. Of the eight different products produced by Kellogg, seven contained composted biosolids. In the case of Scott's Hyponex, fifteen different products were available and only one product contained composted biosolids. A significant portion of the biosolids used by Kellogg and Scott's Hyponex is obtained from the Inland Empire Utility Agency's existing compost manufacturing facility. The relative quantities of biosolids-based compost moving through the distribution chain of these two companies remains proprietary information. Most prevalent in these products was some type of animal manure. There appears to be a long-term deficit of compost product of approximately 95,000 tons per year from four primary firms. These firms expressed a desire to partner with biosolids generators to fill this deficit.

# 9.6.4 Silviculture - Shade Tree Program Assisting Residential Development

Although silviculture refers to the cultivation of trees, the term is often used with regard to a plantation or forest application. These markets are not available in southern California, but a program for planting shade trees in residential areas may be considered as a market for biosolids products such as compost or dried pellets. A healthy sustainable urban forest provides many benefits to its community:

- Natural urban shading and cooling, reducing air conditioning and associated costs
- Reduced energy use, thereby lessening air pollution from electricity generation
- Sequestering up to 26 lbs. of carbon dioxide per mature tree each year, a key factor in the rate of global warming
- Water conservation and reduced stormwater runoff along with associated flooding and pollution (mature trees are able to trap and hold up to 50 gallons of water each)
- Demand for trees, mulch, compost, and recycled water to grow and maintain the forest

Los Angeles DWP is partnering with the Los Angeles Unified School District and the following five non-profit groups to provide a citywide, community based tree planting program. Cool Schools plants trees around school buildings to create shade and cool the classrooms. The US Forest Service determined that for each dollar spent



on the program, \$2.37 was returned in the form of reduced energy expenditures and improved air quality, increased property value, and improved human health. The program includes an environmental curriculum, including biology, botany, horticulture and related topics. Funding for the program comes from DWP's Public Benefits programs. The program has been running for five years and close to 10,000 trees have been planted. This is not likely to be a large market, but it could be a good public relations recycling option, while providing additional benefits to the City.

LADWP also launched "Trees for a Green LA" in 2002, which will plant over 200,000 trees primarily on residential property within their service area. The Bureau of Sanitation would benefit by participating in the existing shade tree programs and/or by leading the development of a new shade tree program through cooperation with other departments. The benefits would include:

- Positive public relations regarding the recycling of beneficial products
- Community outreach with a number of public and private non-profit and for-profit partners expanding its base of support in the community
- Green areas provide better infiltration of storm water
- Leveraging the existing environmental and educational programs within the District's communities with overall goal of creating better, healthier communities.

#### 9.6.5 Biomass/Ethanol Crops

An opportunity exists to land apply biosolids products to facilitate production of crops used in the production of ethanol as a renewable fuel source, or in support of fiber crop production. An option would be for the City to partner with a private sector farmer with enough land available to consumptively use all, or a substantial portion of, the annual biosolids products for the growing renewable energy type crops.

Banning MTBE in California and switching to ethanol would result in significant increases of ethanol consumption in California. It is estimated, based on projected gasoline consumption, that California would consume an average of about 880 MG/year of ethanol from 2003 through 2005, as compared with only about 60 MG/year in 2000.

Creating a viable in-state ethanol industry to capture these benefits, however, poses major challenges. The cost of producing ethanol remains high, requiring continued government price support to make it a competitive fuel additive. Developing a California ethanol industry will also require a state government role to overcome economic, technical, and institutional barriers and uncertainties. California-produced ethanol fuel will face stiff competition from out-of-state ethanol supplies and in-state petroleum products. Commercializing new technologies for converting biomass to ethanol raises uncertainties and presents challenges that must be overcome to foster and nurture a commercial ethanol industry in California.



There are companies that have started ventures for developing crops for ethanol production. One farm of around 80,000 acres would be able to supply approximately 25 percent of the California demand for ethanol as a fuel oxygenate. This provides a significant opportunity for beneficial use of biosolids. However, to date, much of the land that has been considered is located on marginal land in Imperial County and San Bernardino County, both of which do not allow land application of biosolids. Whether the counties will allow the use of EQ biosolids products to support the development of a new industry within the counties has not been explored in much detail. It is likely that this issue will be brought up, once the ethanol crop companies have further developed their ventures.

#### 9.6.6 Citrus, Avocado, Vineyard, & Orchard

Fruit tree production has developed into a highly specialized and intensive production system that tends to exploit the soils to its maximum productivity. Recently the limited use of manure and soil organic amendments, lack of crop rotations, the frequent use of clean cultivation, lack of cover crops, little fallow time, increase in traffic of orchard machinery, and intensive inorganic fertilization and herbicide programs have accelerated soil exploitation.

To help better provide this growing environment the concept of sustainable agriculture, defined as the "long-term use of resources without degradation", has become a major subject of study. From this research, principles and guidelines have been developed focusing on the preservation and promotion of long-term soil fertility through sustainable agriculture. Biosolids products can provide this organic matter. A significant quantity of heat dried products have been used in the citrus industry in Florida. In Southern California, 210,000 acres are in orchards of various crop types. It is not known precisely how many of the acres are available for product application. The theoretical market capacity at an application rate of 20 tons per acre would equal about 4.2 million tons per year.

This market is especially vulnerable to fertilizer demand and public pressure. This highly seasonal market is only available during spring fertilization season before fruit set. Biosolids demand would also depend upon the cost and availability of fertilizer alternatives. Since farming is such a low margin industry, it would be unlikely that a farm would use biosolids in the face of any public pressure. Any stigma attached to the farmer's food would lower the price they could charge for its produce. For this market to be effective public protest and perception would have to be controlled. Segments of the public may be particularly unwilling to allow biosolids used in production of their food. They are concerned about any potential contamination or disease spread that could occur through their food. In addition, the City does not apply biosolids to food crops and would therefore not pursue this market.



## 9.6.7 Ag-lime Applications

The Ag-lime application market consists of the application of high pH biosolids products containing lime to agricultural land. Ag-lime products are typically used to increase the pH of acidic soils. There has been limited development of the market for alkaline stabilized products in the western U.S. Most of the growth has been in the eastern U.S., where the soils are acidic and can use lime. Alkaline soils common in southwestern states will not benefit from addition of a high pH product. Addition of a high pH product to alkaline soils can impair the soil properties and the availability of essential plant nutrients. An alternative use that has been suggested is in remediation of sodic soils, which are typically treated with a heavy dose of gypsum to release the salts. However, most biosolids products that contain lime or gypsum, do not have a sufficiently high proportion to assist in remediating sodic soils effectively.

## 9.6.8 Direct Energy Generation

Direct energy production markets refers to the market for power generated by the exothermic combustion or oxidation of biosolids, or through renewable energy recovery through slurry fracture injection as in the proposed TIRE project. Renewable energy recovery aims to provide methane recovery and possibly fuel oil recovery that could be used to for generation of electricity. Although digested biosolids have a lower calorific value than undigested solids, exothermic oxidation can still be achieved in a well designed process such as incineration, or, potentially, super critical water oxidation. Power is typically generated through waste heat recovery, although combined heat and power (CHP) systems that are more commonly used in Europe can provide higher efficiency than steam boilers that have been used in the U.S.

In Southern California, power generation from anaerobic digester gas is widespread, however, this only recovers a portion of the energy value of the biosolids. The focus of biosolids recycling has been on recovering the nutrient value of the biosolids through land application, due to ease of implementation and cost-effectiveness. However, in Europe, Canada and other regions of the U.S. where land application is limited for various reasons, direct energy production through combustion of biosolids has been successfully implemented. Recent changes in land application regulations and in power costs in Southern California have increased the focus on renewable energy sources.

The power industry is a multi-billion dollar industry. At present the renewable energy contribution is not significant, with around three percent of the DWP supply being generated from renewable, and there is a move to increase the contribution of renewable energy sources. The market size relative to the capacity that could be generated from biosolids is very large.



#### 9.6.9 Burned Land Rehabilitation & Erosion Control

Erosion of soil is a common problem associated with any land that has limited vegetative cover whether due to natural causes or human activity. Erosion can be driven by wind or rainfall runoff. Agriculture, arid land, burned land, cleared and undeveloped land and steep slopes have historically experienced significant problems with erosion of topsoil and sub-soils. Erosion control is a factor in several other compost markets including agriculture, landfill cover, disturbed site reclamation and urban landscaping. This assessment does not include these markets. The use of compost products in roadway construction and maintenance and to minimize erosion from construction activity are included in this assessment. Compost is the biosolids product with the best structure to assist in preventing erosion. The objectives of using biosolids products for erosion control are twofold:

- To provide physical containment of soil particles. A coarse wood mulch provides a structure against the soil that protects soil particles from the impact of falling rain and the resulting runoff along the soil surface.
- Plant growth nutrients that assist the development of healthy plants and root system, which provide long term protection, and containment of soil.

The target market for roadway uses are primarily state and local governmental agencies. For construction projects both private developers and public agencies would be the target markets. Local permitting agencies and the landscaping and construction industries would be a focus for any marketing effort. For burned land rehabilitation, the Bureau of Land Reclamation would be the lead agency. To assist with the use of biosolids products in these markets, biosolids needs to be added to the list of permissible or preferred products. The City has already undertaken to start this process. The California Department of Transportation (Caltrans) has a program that supports the use of compost for erosion control. Since compost is an EQ product, there should not be any local restrictions on its use in most local jurisdictions. Bid Los Angeles Basin prices paid by Caltrans during 2001 ranged from \$ 520 to \$ 555 per ton of compost in place (CDOT, 2002). Even with the cost of transportation and blower truck application, the revenue potential for this use appears to be considerable.

Use of compost for preventing erosion during and following construction or for burned land rehabilitation would likely require action by the Regional Water Quality Control Boards and/or the local development permitting agencies in order for a market to develop. Runoff quality, odors during application, dust, ammonia release during application, and potential for public contact may be issues raised during an environmental review.

Primary efforts to use compost for erosion control have occurred in Oregon, Washington, Texas and California. The States of Washington and Minnesota have developed Standard Specifications for use of compost for erosion control in highway construction projects. California has developed draft specifications.



## 9.6.10 Direct Landfilling

Landfilling of biosolids under the current system of dry landfills cannot be considered a beneficial use of biosolids, and therefore does not satisfy the IRP guiding principle of 100 percent recycling. If regulations in the future allowed the wet landfills that could be operated as landfill bioreactors with organic wastes included rather than diverted (as per AB 939), landfilling could be considered as a beneficial use of biosolids for generation of landfill gas.

At present, however, there may be occasions when a landfill could serve as an failsafe or backup option. Of a total of 102 landfills in Southern California, 17 landfills are permitted to receive biosolids. The theoretical biosolids capacity for the Southern California landfills is about 16.6 million cubic yards (7.5 million wet tons). This is not the realistic operating capacity. The operating capacity reflects the daily allowable throughput at the landfill. Additionally, the operating capacity was reduced to reflect only those landfills with sufficient remaining capacity (typically in excess of 1 million cubic yards) that would make the contracting effort worthwhile. Applying these criteria reduced the number of landfills to seven and the throughput capacity to about 9,200 tons per day. Following the 10:1 ratio, at these landfills the available spare capacity is estimated to equal 920 tons per day of biosolids. Beyond California, there are landfills available in Arizona. Regulations have been implemented to reduce the volume of waste being sent to landfills, and to achieve the diversion requirements, it is preferable not to landfill biosolids.

## 9.6.11 Landfill Partnering- Alternative Daily Cover

Under current regulations, owners or operators of all municipal solid waste landfill units must cover disposed solid waste with a minimum of six inches of compacted earthen material or alternative material at the end of each operating day, or at more frequent intervals if necessary, to control vectors, fires, odors, blowing litter, and scavenging. Compost, co-compost, and chemically fixed sewage sludge, which meet the performance standards for cover material, can be utilized as alternative daily cover (ADC) and shall be limited to up to 25 percent of landfill cover materials or landfill cover extenders as required under Public Resources Code (PRC) 42245, and the new CIWMB ADC regulation. The 25 percent limit applies on a quarterly basis to the total daily and intermediate cover or cover extender use. Landfill cover means compost, co-compost, or chemically fixed sewage sludge blended or mixed with soil. There is significant competition with other wastes for use as ADC, including green waste, auto shredder waste, shredded tires and construction & demolition waste. It is anticipated that regulations may be proposed to prevent the excessive use of ADC as a means of meeting the landfill diversion targets. Landfill ADC may be considered a back-up market for biosolids products.



#### 9.6.12 Construction Material Markets

There are a number of different types of construction material products than can be generated from biosolids. These range from dried biosolids and soil mixtures, to glass aggregate, and inert, sandy materials. The primary markets available for these products are as construction fill, road fill and for use in the manufacture of cement. This review will provide an overview of the construction material market, rather than going into detail on specific markets.

The construction industry market has not been widely used as a potential market for biosolids, largely due to the relatively low number of facilities that produce biosolids products that would be suitable for this market. However, discussions with American Remedial Technologies and TPS Technologies that are involved in the recycle of non-hazardous, contaminated soils indicate that there is a large market for soil type materials for use as fill in construction and development projects.

One company that has developed a process for converting waste materials, including biosolids, into a glass aggregate product that is marketed to the construction industry is Minergy Corporation. The product from a mixed waste process is a light weight glass aggregate that may be used in the marketed as a material for use in the manufacture of lightweight structural concrete, lightweight concrete masonry, insulating concrete, as a lightweight and fire resistant mineral filler, or as landscaping ground cover. Glass aggregate from a biosolids only process is most likely to be marketed as pavement and construction fill material. Other construction and non-construction material markets could be developed, including floor tiles, abrasives, roofing shingles and decorative landscaping, but would require a higher level of marketing effort in California, according to Terrence Carroll, a Regional Manager with Minergy.

The inert ash or sandy material from incineration or super critical water oxidation process can also be used in the construction industry. These materials typically pass the EPA leach test and are therefore not considered hazardous. The Minneapolis, Ohio, biosolids incineration ash has been used for cement manufacture and building product manufacture over the last nine years. The most viable market has been as an admixture in cement kilns, where there is some evidence that the metals in the ash act as a catalyst.

The overall aggregate market exceeds 3 billion tons per year in the United States. At an average product price of \$4.83 per ton the market size exceeds \$14 billion per year (U.S. Geological Survey, 2001). The U.S. Geological Survey estimated that the recycled aggregate market sector is growing rapidly and will continue to do so.



#### 9.6.13 Non-Construction Material Products

Non-construction materials include items such as bricks and tiles that may be used in buildings. Several products are feasible in this category. Combustion and super critical wet oxidation processes produce an inert sandy material that can be used as in the manufacture of products such as tiles and bricks. Vitrification processes, such as the Minergy glass aggregate process, produce a hard, granular, black, glassy product that can be used in the manufacture of tiles, bricks, roofing shingles and other products. This is a more lucrative market than the construction materials market. However, it will be a more difficult market to penetrate as many of the materials will be used in residential structures and in forms with which people will be in close contact. The potential for negative public perception may restrict this market to a few industrial uses or roofing products.

This is not a market that has been widely considered for biosolids products. Minergy claim that their glass aggregate products from the biosolids or mixed waste vitrification processes may be used in non-construction material manufacturing. However, in discussions with Minergy, it appeared that their first target market in California would be the construction material market as the product would be more acceptable. In Japan, processes similar to Minergy were developed by Tsukishima Kikai (TSK) Corporation. TSK supply thermal treatment processes and incineration facilities for treatment of wastes and developed a process for biosolids vitrification or melting. TSK formed the molten biosolids into brick and artificial stone. However, lack of acceptance of the product and process economics have led to TSK removing the process from their list of supplied technologies.

Although a number of biosolids aggregate or inert ash products could feasibly be used as non-construction materials, acceptance has been a primary draw. The market for non-construction material products is strong. However, the market for biosolids products as a non-construction product material is likely to be considerably smaller than for construction materials, due to the lower acceptance of biosolids products for such applications. If biosolids could be sold into these markets, the product value would be in the range of \$15 to \$25, according to Minergy.

# 9.6.14 Dedicated Land Disposal

Since 1931, the Holloway Company has been mining gypsum from property near the intersection of Interstate 5 and State Highway 46 in Kern County, California. These operations have left many hundreds of acres of open pits over 55 feet deep. It has been proposed by GeoManagement LLC to allow the filling of these pits with 2,000 wet tons of biosolids per day. According to GeoManagement, the property, has enough capacity to accept biosolids at this rate for over 40 years. The first open pit to be filled is 150 acres in surface area and has an average depth of 55 feet. This pit will take over 15 years to fill. Other wastes will be accepted, including auto shredder waste and construction and demolition debris. Upon delivery, the biosolids will be air dried and then combined with ash and local material in large mixers, already on site from the mining operation. This mixture will be landfilled over a 48-hour cover cycle.



The site received a negative declaration for CEQA compliance, but has not yet obtained all the required permits and approvals. The facility is an unlined landfill. It sits atop a layer of 120 feet of impermeable clay that sits upon a very small and poor quality water table. A leachate collection system will be required. It is expected that all potential contaminants would be contained by this clay layer.

The economics of disposal at the facility are composed of a tipping fee and transportation cost. The tipping fee is estimated to range from \$10 to \$35 per wet ton plus line haul transportation up to \$20 per ton<sup>1</sup>. Being a disposal option, this does not fit the goal of 100 percent beneficial use of biosolids.

## 9.6.15 Fuel Usage (Oil, Char)

Fuel usage markets are considered for the fuel products, char or oil, generated by pyrolysis and gasification processes, which then need to be marketed to facilities that can use the fuel. The total heating value of the products cannot be greater than the calorific value of the feed solids. The feed biosolids calorific value is typically around 6,500-7,500 Btu/lb dry solids for digested biosolids and 9,000 Btu/lb dry solids for undigested biosolids. The form of the fuel products, the moisture and the actual heating value of each product will vary depending on the process. In addition, thermally dried biosolids may be combusted as a fuel product, and would have a calorific value of around 7,000 Btu/lb if digested biosolids were used. Through the rest of this discussion, the term char will be deemed to include heat dried biosolids granules.

Some processes produce a low grade oil, similar to a kerosene type product, or a No. 7 oil. Industry experience indicates that the oil product is difficult to market and may processes avoid producing it. The char solids content may vary from 50 to 95 percent. Local uses for the char are in cement kilns and biomass waste to energy plants. Cement kilns prefer a char with maximum moisture content of 8 percent for use in the clinker zone. Char used in the pre-calciner zone can have higher moisture content of up to 50 percent. Utilization of alternative fuel sources in cement kilns or other energy facilities has been practiced for decades.

Fuel char, at 6,500 to 9,000 Btu/lb is a low to mid-range energy value product compared to tires that contain 12,000 to 16,000 Btu/lb. In comparison, bituminous coal has energy values ranging from 11,000 to 13,000 Btu/lb., fuel oil (No. 6) has 18,000 to

18,500 Btu/lb, wet wood (hogged fuel) has 4,000 to 5,000 Btu/lb, and agricultural waste has 5,000 to 8,500 Btu/lb (CIWMB, 1992). The use of char by a cement kiln will depend on the design of the cement plant and the BTU of the fuel normally used.

<sup>&</sup>lt;sup>1</sup> For a haul distance of 200 miles one way at \$2.50 per mile (one way distance) the cost per load equals \$500. At 25 tons per load the unit cost of transportation equals \$20 per ton.



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### 9.6.16 Summary of Biosolids Product Markets

The markets described above were evaluated based on a number of factors, such as regulatory restrictions, market risk, public perception, and political constraints. The summary of this evaluation is presented in Table 9-7. To assist the review of the markets, color-coding was used, with red indicating high risk aspects of a market, yellow indicating aspects requiring caution and green representing low risk. Landfilling and ADC markets were not color coded as these should be considered as failsafe or back-up options. Market categories that are colored in red will not be considered further.

# 9.7 Introduction and Pre-Screening of Product Technologies

The approach to evaluation of the biosolids management options has focused on coordinating two key aspects, the biosolids markets and the product technologies that can process the biosolids to form a product that is compatible with the available markets. Sustainable biosolids management needs to consider a business-type approach, where suitable markets are first identified and then the steps necessary to provide suitable products are implemented. This evaluation of biosolids management, therefore, first pre-screens the available biosolids product technologies to identify any that are inappropriate for further consideration in the IRP, and to identify the types of products provided by the range of technologies. This was followed by a more detailed ranking of the main product technology categories, to assistance in developing planning recommendations.

There are a wide range of technologies available for biosolids treatment and production of a biosolids product. As discussed in Subsection 9.5.2, the City has received a number of proposals from vendors of different product technologies in response to Class A and drying RFPs. These were considered in the product technology evaluation. The team also added appropriate technologies for which the City has not received proposals, but that may be feasible. The product technologies were assigned to eleven broad categories.

The technologies were initially reviewed to identify any fatal flaws, such as processes that are not identified in the Part 503 regulations as meeting Class A pathogen densities. Any process that can produce Class A pathogen density levels only under Alternatives 3 and 4 (by testing for pathogens in the product) will be discounted from detailed evaluation as there have been indication that these may be deleted from the regulations in the future. In addition, any processes that do not provide a stable product without offensive odor will also be considered to be inappropriate for further



## Table 9-7 Biosolids Cropping Markets Summary & Evaluation

													Backup Option
	History	Market Strength	Current Market Size	Estimate of Future Markets	Competitors	Legal Restrictions	Perceived Market Risk	Public Perception Issues	Product Limits & Preferences	Economics	Political Constraints	CEQA	Assessment of Implementation
General land application for non-food crops at City farm ⊖	Substantial & Proven	Fair ⊖	292,000 WT/yr <sup>1</sup> ; 36,500 WT/yr <sup>2</sup>	Uncertain ⊖	Increasing	Tenuous ⊖	Somewhat risky ⊖	Negative	Normal	\$22-35/ton cost ⊖	Tenuous ⊖	General Order under litigation	Feasibility will decline over next 2-3 years
Land application for non-food crops at City farm	Substantial & Proven	Good ©	150,000 WT/yr	150,000 WT/yr ☺	None ©	Manageable ⊖	Low – need to manage loading rates	Uncertain, needs to be managed	Normal ©	\$22-25/ton cost ⊖	Manageable ⊖	None ©	Feasible with biosolids 'products'
Horticulture − City use ©	Substantial & Proven	Good ©	31,000 WT/yr	31,000 WT/yr ©	Many; current local suppliers ⊖	None ©	Somewhat risky ⊖	Good ©	Normal ©	\$0-30/ton revenue ©	Low ©	None ©	Feasible; demonstrations; interdept. co-ordination; sales mgt.
Horticulture – ornamental & nursery ☺	Substantial & Proven	Good ©	Uncertain	240,000 WT/yr <sup>3</sup> ©	Many ⊖	None ©	Somewhat risky ⊖	Good ©	Normal ©	\$0-88/ton revenue	Low ©	None ©	Feasible; demonstrations, sales mgt.
Horticulture – blending & bagging for retail	Substantial & Proven	Good ©	1,600,000 WT/yr	1,700,000 WT/yr ©	Many ⊖	None ©	Somewhat risky ⊖	Good ©	Normal ©	\$0-7/ton revenue ©	Low ©	None ©	Feasible; demonstrations, sales mgt.
Silviculture – Shade Tree Program	Substantial & Proven	High ©	0	600 WT/yr ⊖	Few ©	None ©	Somewhat risky ⊖	Good ©	Normal ©	\$55-100/tree cost	Low ©	None ©	Feasible; demonstrations, sales mgt.
Biomass?Ethanol crops ©	Substantial & Proven	Good ©	0	1,400,000 WT/yr <sup>4</sup>	Few ©	May fall under land application bans	Somewhat risky ⊖	Good ©	Normal ©	Uncertain ⊖	May fall under land application constraints	None ©	Feasible; highly challenging; water use issues; need big project partner
Citrus, avocado, vineyard & orchard ⊗	Substantial & Proven but SE U.S.	Poor & failing ⊗	Uncertain	Uncertain ⊖	Conventional & organic fertilizers ⊖	Severe & worsening	Very Risky ⊛	Strongly Negative	Poor farmer acceptance; highly salt sensitive	\$0-Uncertain ⊖	Severe & worsening	None ©	Low feasibility
Ag-Lime Applications ⊗	Substantial & Proven but MW & SE U.S.	Poor ⊖	0	Very little ⊗	None ©	None ©	High ⊜	Strongly Negative (3)	Poor farmer acceptance	Poor ⊖	Severe & worsening	None ©	Low feasibility
Legend:	⊗ Hi	gh Risk "red fl	ag"			⊖ Cautior	n		☺	Low Risk			

<sup>1</sup> RBM contract

<sup>2</sup> Synagro contract

<sup>3</sup> Based on potential California demand for landscaping, delivered topsoil, container nurseries, filed nurseries & sod reduced by 50% for southern California portion of market and using a 40% biosolids compost

<sup>4</sup> Based on one proposal for 70,000 acres at 20 tons/acre, supplying up to 25% of state ethanol

consideration in the IRP. Any biosolids product technology that does not provide a product equivalent to an EQ biosolids standard will also not be further evaluated. As defined by the EPA, EQ biosolids meet all of the following criteria, which refer to the Part 503 regulations:

- Should be below the maximum pollutant levels in Part 503 regulations, Table 1
- Should be equal to or below the average pollutant levels in Part 503 regulations, Table 3
- Should meet Class A pathogen density levels
- Should satisfy one of the first eight vector attraction reduction requirements

A summary list of the product technologies and the preliminary screening conducted is provided in Table 9-8 followed by a brief description of the different categories. The range of products that can be produced from the technologies that passed the prescreening stage were shown previously in Table 9-5. These products were considered when identifying the markets available for biosolids recycling.

	Table 9-8											
	Summary of Initial Screening of Biosolids Product Technologies											
No.	No. Process Appropriate for IRP											
1	Thermophilic Digestion	Υ										
2	Composting	Υ										
3	Heat Drying	Υ										
4	Solar Drying	N – footprint, pathogen										
		reduction control										
5	Bactericides	N – not EQ process,										
		handling & dosing of toxin										
6	Chemical Treatment	Υ										
7	Combustion	Υ										
8	Super Critical Water Oxidation	Υ										
9	Gasification	Υ										
10	Pyrolysis	Υ										
11	Renewable Energy Recovery	Υ										
Note:												
* For pr	ocesses identified to be inappropriate, details were provided in the text be	low										



## 9.7.1 Thermophilic Digestion

The City has converted the anaerobic digestion systems at both HTP and TITP to thermophilic digestion at around 128°F. For the City, this has proven to be a cost effective option for changing from Class B to EQ biosolids. In order to meet Class A pathogen requirements by the Part 503 regulations Alternative 1, the digestion process needs to include a batch holding step to provide the time-temperature holding time. Alternatively, pathogen kill may be demonstrated by testing, and approval obtained by the EPA Pathogen Equivalency Committee. Pathogen regrowth may be an issue and has been noticed to coincide with use of high speed centrifuges for dewatering. The City has taken steps to insure that at the time of land application pathogen regrowth has not occurred in the biosolids. Thermophilic digestion may increase odors at the plant site, particularly if the digester head space is not adequately sealed, and also from the dewatering process and filtrate. Final product odors may be reduced compared with Class B digested biosolids.

Thermophilic digested biosolids that do not undergo further processing maintain a higher level of plant nutrients, including nitrogen and phosphorus, than compost products, where additional biological activity is conducted. Thermophilic digested biosolids may be further processed by any of the other technologies listed, as an additional step to convert the biosolids to a different product form, such as pellets or char. The City is currently employing a successful thermophilic digestion process, with the biosolids used for bulk land application to non-food crops.

## 9.7.2 Composting

Composting refers to the biological, aerobic stabilization of biosolids with an amendment to improve texture. The process is typically autothermal and generates sufficient heat to maintain temperatures over 55°C for at least three consecutive days, thereby producing an EQ product. There are a number of different composting processes including:

- **Vermicomposting**: composting with the addition of worms;
- Aerated Static Pile: composting in piles that have forced aeration, and therefore do not require turning as with windrows; and
- **In-vessel composting:** these require the construction of defined cells in which the composting takes place. The depth of the beds varies from around 8 ft to 24 ft depending on the specific process.
- Windrow composting: not considered to be long term sustainable for large facilities due to the air and particulate emission issues with this method, the difficulty of process control and the draft Rule 1133 regulations that will effectively eliminate this as an option for processing biosolids in parts of Southern California.



## 9.7.3 Heat Drying

Heat drying processes use a fuel source to significantly reduce the volume and mass of biosolids produced at the facility and reduces pathogens and vector attraction. This provides a much more rapid process than the traditional sludge drying bed approach, which used natural heat and sunlight for drying. Heat drying processes that are considered here for treating biosolids are less complicated than the Carver Greenfield type of process, as the biosolids are dried in air, not in hot oil, and therefore there is no oil recovery process. In addition, the movement of biosolids is conducted by mechanical means, rather than by pressure differentials. Heat dried biosolids meet requirements of the Part 503 regulations for vector and pathogen control and the biosolids are classified as an EQ product. The heat drying process is based on reduction of water content in dewatered biosolids by evaporation. This process produces heat dried pellets that are typically used as soil fertilizers and can be spread on agricultural land, golf courses, or park land to provide the soil with nutrients and minerals. Dried biosolids may also be used as a fuel source for energy recovery. Many of the existing municipal heat drying facilities in the United States secure long-term contracts with private biosolids management companies for year-round recycling of dried biosolids. The pellets can be hauled off in bulk in trucks, or the solids can be bagged and marketed to retail outlets as organic soil fertilizer.

Several support systems are required to provide a complete and safe operating heat drying system. When considering any heat drying process, it is important to consider vendors that provide the entire system as a complete package, to ensure that all components of the system work together as a whole. Heat dryers can be classified into two main categories, direct and indirect. In addition, the City has received proposals from facilities that would dry biosolids with heat-treated soil, and this specific category has been added to the evaluation of heat drying. A more thorough analysis of heat drying is presented in Appendix K.

- Direct Dryers: dewatered biosolids come into direct contact with hot air. The hot air can be direct exhaust air from a gas burner or can be produced in a heat exchanger. The predominant method of heat transfer in direct drying systems is convection. Direct drying systems include rotary drum dryers, belt dryers and flash dryers. There are over 40 direct rotary drum dryer installations in North America, the largest of which is at the 180 mgd Louisville wastewater treatment plant.
- Indirect Dryers: the heat transfer medium (steam, hot water, oil) is used to transfer to metal surfaces that contact the biosolids. Indirect heat drying equipment includes paddle heat dryers, disk type heat dryers, and multiple-hearth heat dryers. Fluidized bed dryers can be arranged both as direct and indirect type systems. There are over ten indirect dryers in North America, and a large number in Europe. The Komline Sanderson paddle dryer is the most common and may be more cost effective at small plants than rotary drum dryers. The STORD dryer is a disc dryer that was not successfully applied to biosolids processing. Four facilities installed this dryer in the 1990s, including the City, but all have been shut down due to operational and odor issues.



■ Indirect Drying with Heated Soil: biosolids are mixed with soil at temperatures over 500°F that have been heated in a rotary drum dryer for treatment of non-hazardous organic compounds. The biosolids should be well mixed in an enclosed chamber, with the off-gases vented to the thermal oxidizer used to treat vapors from the soil treatment process. The biosolids provide moisture and organic content to the treated soil, which improve the soil characteristics.

### 9.7.4 Solar Drying

There are two sub-categories under solar drying:

- Green house solar drying; and
- Open air solar drying.

#### Greenhouse Drying

Enclosed green house solar drying uses solar energy, enhanced through green house construction and air circulation control, to provide faster and less odorous drying than conventional solar drying beds. It is claimed by the manufacturer (Parkson) that the process produces Class A pathogen levels, but it does not fit any of the Part 503 regulations alternatives for Processes for Further Reduction of Pathogens (PFRPs). An estimate provided by Parkson Corporation for a solar drying system required 20 acres to treat 188,000 wet tons per year of digested and dewatered biosolids. At the City's current solids production of around 850 wet tons per day, the footprint required would be over 30 acres. This option is considered to have a fatal flaw due to the following reasons:

- Large footprint and number of modules required; and
- Currently meets Class A pathogen requirements only under Part 503 regulations Alternative 3 or 4.

#### Open Air Drying

The Yakima Company has proposed open air solar drying of the biosolids cake at the La Paz Landfill in Arizona, with the biosolids cake dried to approximately 90 percent over a four-week period and used as alternative daily cover (ADC) for the landfill, or for composting. Although the site at present is considered sufficiently remote to not raise objections to odors or flies, this alternative will not be considered further for the following reasons (This option, however, may be considered as a failsafe, backup option for biosolids processing and recycling):

- Biosolids would be managed outside of California, where the City would have no say in future regulations. La Paz County has recently started to consider a ban on Class B land application;
- The option may meet Class A by Alternative 3, but not as a PFRP and reliability of the pathogen kill is questionable;



- These could be environmental impacts and emissions from the long-hauling distance and no process emission control; and
- Odors and flies may eventually raise objections from locals or from landfill workers.
- Management of the environmental impacts, nuisance and containment of leachate does not appear to be adequate.

#### 9.7.5 Bactericides

Treatment with bactericides requires the addition of toxic chemicals in sufficient quantity to the biosolids to effect the required pathogen kill. The dose can be controlled to provide Class A or Class B level of pathogen kill. This does not fit any of the Part 503 regulations alternative for PFRPs and would need to be routinely tested for Class A compliance under Alternative 4. The review of this options is based on information provided by Evergreen Organics regarding their use of the bactericide Busan 1236 (sodium N-methyldithiocarbamate) and technical experience gained in tests done by Atkins in the U.K. using borates for pathogen kill in digested biosolids. A dosing requirement stated in the information provided by Evergreen Organics was 0.5 percent metam sodium and 1 percent potassium hydroxide per wet ton of biosolids. At the current biosolids production of 681 wet tons per day, this would require a chemical consumption of 3.4 tons per day metam sodium and 6.8 tons per day potassium hydroxide, which is a considerable amount. Based on the review of available material this option is considered to have a fatal flaw for the following reasons:

- Can only qualify for Class A pathogen standards under Part 503 regulations Alternative 3 or 4
- Does not meet the Class A requirement for vector attraction reduction to be conducted simultaneously to or after the pathogen reduction step²
- The bactericides are extremely toxic and require special training and personal protective equipment (PPE) for handling. Permitting of such chemicals at the City's wastewater plants would be extremely difficult, particularly given the amount that would be required
- Improper dosing would result in a negative impact on the land to which the biosolids are applied. To meet Class A pathogen levels, given the variability in feed pathogen concentrations, it would be difficult to maintain the correct dose. The process would be more suitable for Class B pathogen requirements

<sup>&</sup>lt;sup>2</sup> Documentation from Evergreen Organics stated that the process meets VAR since the final moisture content is less than 25% after blending with bulking agents and has a specific oxygen uptake rate (SOUR) that meets VAR requirements. However, the vendor has misinterpreted the VAR requirements, as the 40 CFR 503 VAR Option 4 on SOUR is only permitted for sludges from aerobic treatment processes and Option 7 requires a dryness of 75% before blending with other materials.



Addition of bactericides does not improve long term stability of the product. Since the cake would need to be stored until the bactericide concentrations are below the toxic limit, there is the potential for odor generation from the stored biosolids and pathogen re-growth

#### 9.7.6 Chemical Treatment

#### 9.7.6.1 Alkaline Stabilization

There are a wide range of alkaline treatment processes available and the three subcategories reflect the key process differences:

- **Neat alkali (quick lime) processes:** these require the addition of a high quality lime product such as quick lime;
- Fly ash and waste alkali processes: these processes use lower quality, but potentially cheaper, alkaline waste products such as fly ash from cement kilns; and
- **Neutralization processes:** these processes use an alkali with sulfuric acid to provide a product with a neutral pH.

Some of the alkaline stabilization processes also include a drying step, which may be optional, to produce a drier, potentially better quality product. There are a large number of alkaline stabilization processes and facilities. Most are in areas where the soil has a low pH, as this provides a market for bulk land application of high pH biosolids.

#### 9.7.6.2 Chemical Fortification

Chemical fortification processes include the addition of chemicals and biosolids, to produce a high end fertilizer with specific properties that can be sold to the retail agricultural or consumer market. Typically a base such as anhydrous ammonia and acids such as sulfuric acid or phosphoric acid are used, producing an exothermic reaction. The level of fortification may be low, medium or high, depending on the local market requirements and process economics. There are few chemical fortification facilities in North America.

## 9.7.7 Complete Combustion

Complete combustion is the oxidation of organics in the presence of sufficient oxygen for complete combustion. The net fuel production depends on the heating value and the moisture content of the feed substrate. It includes the following categories:

■ Combustion: the flue gas temperature must be raised to a minimum of 1,400°F for complete oxidation. Operating temperatures inside the reaction chambers are usually higher. Afterburners in California normally must be operated at 2,000°F for two seconds to reduce total hydrocarbons. To be autogenous (no addition of supplemental fuel) using undigested sewage solids, cake solids concentrations must be greater than 28 percent. Alternatively, co-combustion can be conducted using biosolids and a fuel source with a higher calorific value, such as wood waste.



- Plasma Assisted Oxidation: uses a plasma arc to sustain the oxidation process by generating UV radiation and ionic radicals, which catalyze the oxidation and cracking reactions at lower temperatures of 1,100°F and with feed organic concentrations as low as 20 percent, depending on the calorific value of the feed.
- **Vitrification:** or the melting of biosolids is conducted at high temperatures in the range of 2,600-2,900°F and at atmospheric pressure, in the presence of oxygen. The inorganic fraction melts, while the organic fraction burns to produce heat. The molten solids are then cooled to form a hard glass aggregate or granular product.

Raw primary solids have the highest heating value. The use of chemically enhanced primary treatment and digestion reduces the BTU value of the biosolids.

## 9.7.8 Super Critical Water Oxidation

Super critical water oxidation (SCWO), also known as wet oxidation or wet combustion, is the oxidation of organics at super critical pressure and temperature in a liquid state (for water, critical temperature = 705°F, critical pressure = 3,200 psi), with the addition of compressed air or oxygen into the pressure vessel. The process is highly exothermic. The degree of oxidation is dependent on the temperature and pressure. Sub critical wet oxidation, such as the Zimpro process, does not fully oxidize the organics and produces difficult to treat waste streams. Therefore, subcritical wet oxidation will not be considered in this evaluation. For SCWO, temperatures are typically in the range of 700 to1,100°F and pressures in the range of 3,200 to 4,000 psi. The process configuration may be a below ground well type system or an above ground pressure reactor system.

## 9.7.9 Gasification/Starved Air Combustion

Gasification is a combination of complete combustion and pyrolysis, with better control of air emissions and lower particulates than complete combustion. However, it is not yet well understood, particularly for feed substrates such as biosolids, and the yields of off-gases and residues must be determined by pilot testing. The products are combustible gases, which usually have a fairly low heating value, tars, oils and a char with a heating value. This process has been conducted in multiple hearth furnaces with sewage solids to produce a gas that is subsequently combusted in the afterburner to provide the needed temperature to lower hydrocarbon emissions. Air or steam can be injected into the lower hearths to completely oxidize any tars or char.

## 9.7.10 Pyrolysis

Pyrolysis is the conversion or cracking of biosolids at high temperatures, in the absence of oxygen. As most organics are thermally unstable, they are split by a combination of thermal cracking, and condensation reactions into gaseous, liquid and solid fractions. The process is highly endothermic, but usually produces a char and sometimes an oil that have heating value. The products depend on the temperature at which the process is conducted. Pressures may range from 0 to 3,000 psi. The following subcategories will be considered in this analysis:



- Low temperature pyrolysis: takes place at temperatures < 600°F, and typically does not produce an oil stream;
- **Mid temperature pyrolysis:** takes place at temperatures in the range of 800 1,000°F, and typically does produce an oil stream, as well as a char with fuel value.
- **High temperature pyrolysis:** takes place at temperatures in the range of 1,200-1,800°F and typically produces an ash rather than a solid fuel.

Pyrolysis processes are being developed, with much work being conducted in Europe and Asia. It is not yet considered a proven technology for biosolids.

### 9.7.11 Renewable Energy Recovery (TIRE)

Renewable energy recovery is the placement of liquid biosolids through deep wells that connect with depleted oil and gas reservoirs at depths of 5,000 ft or more, using a technique know as slurry fracture injection (SFI). It is anticipated that biosolids can be used for enhanced oil and gas recovery and will also continue anaerobic biodegradation. Bench–scale tests conducted by the City and by the University of California in Los Angeles (UCLA) to simulate conditions in the deep formations have shown that significant amounts of methane are produced. The carbon dioxide produced will preferentially dissolve in the formation waters at the high pressure, while high quality (90 percent), high pressure methane can be recovered from gas wells, while providing carbon sequestration. SFI is an established technology for disposal of oil field brine and slurries.

The City has identified a suitable formation below TITP and is developing a demonstration project, known as the Terminal Island Renewable Energy (TIRE) project, to develop this technology. The City has been working with EPA staff to ensure that the well design, monitoring instrumentation and safety features are of the highest standard. The formation in which the biosolids will be placed has at least a dozen impermeable confining zones between it and the nearest potable water quality aquifer. The initial economics appear to be favorable, while providing many advantages such as energy recovery for green power generation, minimizing odor and diversification into alternate uses of biosolids. If successful, this technology could provide cost-effective biosolids management for many agencies in California and other areas where there are depleted oil reservoirs.

## **9.7.12 Summary**

The results of the initial screening step are provided in Table 9-8 and show that of the 11 broad categories of product technologies, two have been considered to have fatal flaws, while nine categories will be carried forward for more detailed evaluation of the viable technologies.



## 9.8 Biosolids Product Technology Screening Criteria

To evaluate the wide range of available biosolids product technologies, four broad objectives were identified that should be met by any product technology. These objectives listed below reflect key issues of concern for the City, the IRP, and biosolids management in Southern California:

- Protect Public Health and the Environment
- Provide System Reliability
- Enhance Cost Efficiency
- Implementation/Quality of Life

In order to assess how well the technologies met these objectives, a number of criteria were developed under each objective, by which each technology could be evaluated. Each objective was considered equally important. The criteria are in keeping with the management goals identified in this task and in the City's Biosolids EMS. Each technology will be assigned a score between one and five to reflect its performance for each criteria. A score of 1 indicates a low performance and reflects negatively on that technology. A score of 5 reflects a high score and reflects positively on that technology. The technology score for a particular criteria will be multiplied by the importance weighting for that criteria and the sum of all the results for a the technology will be used to rank it in comparison to the other technologies.

## 9.8.1 Protect Public Health and Safety

For the biosolids evaluation, four criteria were selected under the objective of protecting public health and safety. These include:

### 9.8.1.1 Long Term Regulatory Compliance

Long term regulatory compliance criteria considers current, emerging and proposed regulations, as well as considering the regulatory 'crystal ball' and the City's Biosolids EMS. Potential federal, state and local regulations and ordinances are covered by this criteria. For any process to be sustainable in the long term, current and potential regulatory issues must be minimized.

#### 9.8.1.2 Traffic

Traffic is a critical issue for environmental impacts and public acceptance of a new facility. Processes that reduce the traffic impacts will score higher on this criteria, this may be through location on or adjacent to the wastewater treatment plant site, or through reduction in the volume of product for final recycling.



#### 9.8.1.3 Air Quality and Odor

Air quality is very important for environmental impacts, regulatory compliance and permitting. Odor is another critical issue for public acceptance and the long term sustainability of a facility and has to be considered so technologies that have odorous processes or products can be rated lower compared with processes that minimize odors.

#### 9.8.1.4 Environmental, Health & Safety Benefits

The environmental, health and safety benefits is a broad reflection of benefits to the environment and to public and operations staff health and safety. These benefits may include implementation of processes that reduce impacts, such as net energy use, use of chemicals or provide a better quality product. This is an important criteria in maintaining good stewardship and conforming to the Biosolids EMS.

### 9.8.2 Provide System Reliability

For the IRP biosolids evaluation, four criteria were selected under the objective of providing system reliability. These were:

#### 9.8.2.1 Industry Experience

Industry experience refers to the level of development and the number of successful, currently operational installations, with the highest score being given to technologies that have similar sized installations to the City. As this is a long term master plan promising emerging technologies should be considered, and these were compared with each other in a separate listing of emerging technologies.

#### 9.8.2.2 Process Reliability

Process reliability refers to operational experience with the technology at past or present installations. For technologies that do not have full-scale installations, a technical evaluation of the process and the equipment will be conducted to rank the anticipated process reliability of the technology. Unreliable processes not only cause operational problems, but also have impacts on other factors such as reliable use of the product, prevention of biosolids being stockpiled, public perception and regulatory compliance.

#### 9.8.2.3 Owner/Operator Options

Technologies that are flexible from an owner and operational perspective are preferable with regards to flexibility of the options for the City. For example, a composting facility could be owned and operated by the City, it could be owned by the City and operated by a contractor, or the City could contract with a privately owned composting facility for a per ton fee. The City could also participate in a regional facility.



#### 9.8.2.4 Production of Difficult Waste Streams

Processes that produce difficult to treat waste streams would score low on this criterion. Examples of difficult waste streams include:

- High nutrient loads such as ammonia and phosphorus;
- High strength loads such as BOD, COD or TSS;
- Ash that may be classed as hazardous; and
- Air emissions that would require extensive treatment for compounds such as dioxins or mercury.

The impact of these waste streams may increase treatment costs and could result in the facility being difficult to site.

### 9.8.3 Enhance Cost Efficiency

For the biosolids evaluation, four criteria were selected under the objective of enhancing cost efficiency. These include:

#### 9.8.3.1 Capital Costs

Facilities with high capital costs result in more of the risk being carried up front, prior to process being implemented. High capital costs may also affect the ease and the cost of obtaining financing. Cost information has been obtained from a number of vendors that cover the range of biosolids product technologies and were used as general guides for comparison of the technologies. Processes that typically have higher capital costs will be score less than those with lower costs.

#### 9.8.3.2 O&M Costs

Facilities that have high O&M costs may have higher life cycle costs. In addition, O&M costs are impacted by changing prices for consumables, such as gas prices. These factors can affect the long term economics of a facility, and therefore facilities with higher O&M costs score lower in this regard.

#### 9.8.3.3 City's Investment Risk

Investment risk is a reflection of the level of risk that the City takes when investing in a technology option and will consider the level of investment in conjunction with the risk associated with that investment. Although investment risk is an important factor, as it is an anticipated future level of risk based on technical judgment. Technologies that are only suitable for private ownership and financing score high on this criteria, as there is little investment required from the City. Technologies that are suitable for ownership by the City may score lower on this criteria, based on the estimated level of investment that would be required, and the level of risk associated with the facility.



#### 9.8.3.4 Compatibility with Existing Facilities

Technologies incompatible with existing facilities would be ranked lower in the evaluation. The City is committed to maintaining anaerobic digestion and maximizing biogas recovery to reduce on-site electrical costs. Technologies that have an adverse impact on the existing facilities such as recycle streams, large footprints, or feed requirements will be assigned a lower score. This is an important issue in terms of site complexity, operations and land use, however it is not as critical as other factors that can make or break an option, as for most technologies, these issues can be managed.

## 9.8.4 Implementation/Quality of Life

For the biosolids evaluation, four criteria were selected under the objective of ease of implementation and maintaining quality of life. These include:

#### 9.8.4.1 Public Perception of the Facility

Public perception and acceptance and adhering to EMS requirements are key issues in Southern California and are also factors in siting and implementation of a facility. Technologies such as incineration, or facilities that have a tall stack, may have negative public perception due to aesthetics and health concerns about stack emissions, unless they are situated in remote or heavily industrialized areas. This issue is considered critical, as public perception is key to the successful siting and implementation of a facility.

#### 9.8.4.2 Ease of Siting In Southern California

Ease of implementation and siting ties in a number of factors that will affect the ability of a facility to be located in Southern California, including location, public perception, regulations, permitting and land requirements. Facilities that would be difficult to site in Southern California reduce the probability of implementation and continuing operation, and could attract negative publicity for the City. This is considered a key issue in evaluating the technology options.

#### 9.8.4.3 Product Compatibility with Markets

Any process technology must provide a product that is compatible with a reliable market and the product must be meet standards required by that market. This is considered a critical issue to long term sustainability of an option.

#### 9.8.4.4 Product Acceptability

The physical characteristics of the product must be acceptable to the general public since many local regulations have been driven by perception issues.



### 9.8.5 Summary

Table 9-9 provides the criteria used in the evaluation and the importance weighting factor. The criteria were developed in a workshop with City staff and the consultant team and reflect local biosolids issues and City concerns regarding biosolids management technologies and with reference to the City's Biosolids EMS. As all the issues are of importance for a successful biosolids facility, each objective was weighted equally, at 4 points, and each criteria was also weighted equally. The maximum score that can be achieved by any technology is 80 points.

	Table	9-9			
	Biosolids Options	Ranking Criteria			
No.	Criteria	Score <sup>1</sup>	Importance <sup>2</sup>		
1.	Protect Public Health & the Environmer	nt	4		
1.1	Long term regulatory compliance	1 – doubtful; 5 - likely	1		
1.2	Traffic	1 – high; 5 - low	1		
1.3	Air quality and odor	1 – high; 5 - low	1		
1.4	Environmental, health & safety benefits	1 – low; 5 - high	1		
2.	Provide System Reliability		4		
2.1	Industry experience	1 – none; 5 – similar size	1		
2.2	Process Reliability	1 – questionable; 5 - reliable	1		
2.3	Owner/operator options	1 - contractor; 5 - flexible	1		
2.4	Production of difficult waste streams 1 – strong; 5 - none				
3.	Enhance Cost Efficiency		4		
3.1	Capital Cost	1 – high; 5 - low	1		
3.2	O&M Cost	1 – high; 5 - low	1		
3.3	LA Investment Risk	1 – high; 5 - low	1		
3.4	Compatibility with existing facilities	1 – low; 5 – v. compatible	1		
4.	Implementation/Quality of Life		4		
4.1	Public perception of facility	1 – negative; 5 - acceptable	1		
4.2	Ease of siting in S. CA	1 – difficult; 5 - easier	1		
4.3	Product compatibility with markets	1 – not; 5 – v. compatible	1		
4.4	Product acceptability	1 – low; 5 - high	1		
Total			80		
Note: <sup>1</sup> Score – 1	= negative or low score, 5 = positive or high sco	re			

## 9.9 Viable Product Technology Options

The product technology options that are not considered to have fatal flaws were ranked based on the objectives and criteria described above. Evaluating the technologies was based on information from City staff and the IRP team with regard to specific technologies, experience with specific technologies and knowledge of the status of development of technologies. The rankings are shown in Table 9-10. As the categories evaluated are broad there may be specific processes within each that would



score differently on certain evaluation criteria, and continuing developments may also change the scoring. However, the aim of the evaluation is to identify the broad direction of biosolids planning, given the current status of these technologies and the City's approach to biosolids management.

Thermophilic digestion is a technology that will provide compliance with the Part 503 regulations for production of EQ biosolids. However, some counties in California are beginning to regulate EQ biosolids, which will impact feasibility and cost of bulk land application of thermophilic digested biosolids in these areas such as Riverside County and Kings County. Therefore, this technology scores a four for regulatory compliance. Thermophilic digestion reduces the volume of biosolids leaving the plant, and therefore the amount of truck traffic, due to improved dewatering characteristics. Although thermophilic digestion is not widely practiced in North America, the City has proved that the technology can be successfully implemented at a large scale and therefore this scores highly in the process reliability criteria. As this technology maximizes use of existing assets, including digesters and biogas, it scores highly in the cost criteria. The City has rectified the issues related with initial odor problems and has worked to improve public perception of the facility.

Composting with biosolids is a well established technology, with over 100 facilities of various sizes in North America, and therefore scores high in process reliability. Regulatory aspects of composting include air and odor, classification of fertilizer and general use of compost. Rule 1133 implemented by the SCAQMD has impacted the type of facilities that may be constructed in the L.A. area and has set a precedent that may in the future be followed by other Southern California air quality districts. The federal government recently included biosolids compost in the list of approved recycled material that may be used in government projects. However, biosolids compost is excluded from the fertilizers that may be used on organic crops. Due to the wide range of current and potential regulations related to compost, composting scores a three on regulatory compliance. As Rule 1133 has increased the cost of composting within the SCAQMD, it is likely that the more cost-effective facilities will be located further from the City. Composting plants also require delivery of amendments and bulking agents. Therefore composting does not score highly on the traffic criterion. Compost has a well established market in Southern California, but there are concerns with saturation of this market as more agencies in Southern California implement composting for conversion of Class B biosolids to an EQ product.

Heat drying for production of pellets or granules provides a wide range of market options, including those that use the pellets for nutrient value and those that use them for energy production. This ability to diversify the end use makes this option more resilient to regulations and it scores high on this criterion. However, at present the market for pellets in Southern California has not been developed as it has been in Florida, and therefore there will some work necessary to gain product acceptability. Although there is a number of heat drying facilities in North America, the equipment and process are complex and require a high level of operator training and safety awareness, therefore this scores a three for the process reliability criterion. Heat



drying facilities have fairly high capital and O&M costs compared with digestion, or windrow composting operations, although they have a smaller footprint. O&M costs may also be reduced if a facility can be sited where waste heat or biogas is available to reduce energy costs. Siting of a heat drying facility close to a wastewater treatment plant also has benefits in reduced truck traffic, as drying removes most of the water that is still present in digested cake. Due to site restrictions, it is not anticipated that heat drying would be located at the HTP plant site and therefore this is scored three for traffic.

Chemical treatment can produce biosolids that meet EQ standards. However, the addition of highly alkaline products to the biosolids volatilizes ammonia, which can cause odor problems if not properly contained and treated. The need to add chemicals also increases traffic, with the impact depending on the type of process and the ratio of chemicals to biosolids. Use of chemicals may also be viewed as detrimental to the environment and poses health and safety issues. This technology therefore scores two on odor, traffic and environmental benefits. Many chemical treatment processes are well established, including the N-Viro and RDP processes, while some processes are newer and less proven. Therefore this category has been scored a neutral three for experience and reliability. In Southern California the soils typically have a high pH, therefore there is little demand for products with high pH, or with lime or gypsum additives. Processes that provide a high end fertilizer product are likely to be more acceptable, but these processes typically use larger amounts of chemicals and have less industrial experience.

Combustion of biosolids is technology that has been in use for decades. New fluidized bed technology and air quality equipment has enabled combustion to meet increasingly strict emissions regulations. In Europe the share of biosolids being processed by combustion is increasing and in some countries it is the only technology that may be used. This technology therefore scores highly under regulatory compliance. However, in Southern California, siting of a new combustion facility is expected to be difficult, and existing biomass power plants that could be used for biosolids combustion are situated some distance from the City, in Imperial County or northern Kern County. This option therefore scored a two for traffic. Building a new combustion facility or rehabilitating an older biomass power plant is capital intensive. The cost effectiveness of combustion options will also be impacted by federal and state regulations on renewable energy with regard to qualification as a renewable energy facility and renewable energy credits.



**Integrated Resources Plan** Section 9 Biosolids Management

	Table 9-10 king of Biosolids Product Technologies		
Ranking of Bi	iosolids Prod	uct Tech	nologies

			Ranking of B	iosolids Prod	iuct lech	inologies					
			Thermophilic Digestion	Composting	Heat Drying - Offsite		Combustion	Super Critical Water Oxidation	Gasification	Pyrolysis	TIRE
No.	Criteria	Weighting	Score <sup>1</sup>	Score <sup>1</sup>	Score <sup>1</sup>	Score <sup>1</sup>	Score <sup>1</sup>	Score <sup>1</sup>	Score <sup>1</sup>	Score <sup>1</sup>	Score <sup>1</sup>
1	Protect Public Health & the Environment	4	14	10	15	10	13	15	14	14	18
1.1	Long term regulatory compliance	1	4	3	5	4	4	4	4	4	5
1.2	Traffic	1	3	1	3	2	2	4	3	3	4
1.3	Air quality & odor potential	1	3	3	4	2	4	4	4	4	4
1.4	Environmental, health & safety benefits	1	4	3	3	2	3	3	3	3	5
2	Provide System Reliability	4	17	17	14	12	12	9	8	7	11
2.1	Industry experience	1	4	5	5	3	4	1	2	1	1
2.2	Process reliability	1	4	4	3	3	4	1	2	2	1
2.3	Owner/operator options	1	5	3	2	2	1	2	1	1	4
2.4	Does not produce difficult waste streams	1	4	5	4	4	3	5	3	3	5
3	Enhance Cost Efficiency	4	17	15	11	13	13	11	12	12	15
3.1	Capital cost	1	5	3	2	2	2	2	1	2	4
3.2	O&M cost	1	4	3	1	3	3	3	3	3	4
3.3	LA investment risk	1	3	4	3	3	3	1	3	3	2
3.4	Compatibility with existing facilities	1	5	5	5	5	5	5	5	4	5
4	Implementation/Quality of Life	4	14	15	16	13	14	14	12	14	16
4.2	Public perception of facility	1	4	4	4	3	3	3	3	3	4
4.3	Ease of siting in S. CA	1	4	3	4	3	3	4	3	4	3
4.4	Product compatibility with markets	1	3	4	5	3	4	4	3	4	4
4.5	Product acceptability	1	3	4	3	4	4	3	3	3	5
TOTAL		80 <sup>2</sup>	62	57	56	48	52	49	46	47	60

Notes:

<sup>1</sup> Score – 1 = negative or low score, 5 = positive or high score

<sup>2</sup> Maximum score



Super critical water oxidation is an emerging technology. Although it holds promise for regulatory compliance – the products are an inert sand and a high quality effluent and minimal air quality impacts – the process reliability and experience have been the main drawbacks to implementation of this technology. This technology therefore scores highly on the protection of public health and environment criteria, but low on the system reliability criteria. Based on the current state of technology development, the capital costs are estimated to be high.

Gasification is a technology that is being developed in Europe and Asia for management of various waste streams. The products may include a biogas stream, a char, a biodiesel or ethanol type product, and a low grade oil. However, gasification of biosolids is not yet a well understood process and the quality of gas and oil streams has not been of a high quality.

Pyrolysis processes typically produce a char and may also produce an oil or biogas stream. There do not appear to be any significant regulatory compliance issues with pyrolysis processes, although appropriate air emissions control such as a regenerative thermal oxidizer or burning of the off-gases will need to be included. There is little industrial experience with biosolids, therefore this scores low on the system reliability criteria. Product acceptability will depend on the type and quality of product produced. The char made from digested biosolids will have a lower BTU value than coal and will therefore need to find niche markets.

Renewable energy recovery through the TIRE project is a new application of slurry fracture injection. Although this technology therefore scores fairly low on industrial experience and reliability for this application, it has a number of potential advantages. These include regulatory compliance (the only product is expected to be a high quality biogas), traffic reduction as biosolids from TITP do not leave the site and biosolids from HTP may in the future be conveyed by pipe, and minimal odor as it is an enclosed system. Initial cost estimates appear to be favorable. Although siting for such a facility for other agencies may be more difficult due to the need for suitable geological sites in underground oilfield reservoirs, the City has been fortunate to have an ideal site below TITP. The City has conducted an extensive public outreach program and the project has been well accepted by the local neighborhood councils around TITP. Implementation of the proposed demonstration TIRE project will allow corroboration of the scoring provided in this initial assessment.

Table 9-11 summarizes the total scores for the established and emerging technology categories. In the established technologies, thermophilic digestion, as currently conducted by the City, ranked the highest, with composting and heat drying being next ranked technologies. The TIRE project was the clear winner among the emerging technologies. These processing options may be conducted after thermophilic digestion, unless in the future the City selects an option to handle a sufficient volume of digested or undigested solids to allow some or all of the City's biosolids to be processed without prior thermophilic digestion and/or dewatering. This may be the case if the TIRE demonstration project is successful.



	Table 9-11												
	Summary of Initial Screening of Biosolids Product Technologies												
No.	No. Established Technologies Score Emerging Technologies												
1	Thermophilic Digestion	62	Renewable Energy Recovery (TIRE)	60									
2	Composting	57	Super Critical Water Oxidation	49									
3	Heat Drying	56	Pyrolysis	47									
4	Combustion	52	Gasification	46									
5	Chemical Treatment	48											

## 9.10 Recommended Strategy

## 9.10.1 Summary of Viable Management Options

The following recommendations are made for long term direction of biosolids management, based on the above evaluation and ranking of the biosolids product technologies, the evaluation of biosolids product markets, and consideration of the City's Biosolids EMS:

- 1. Continue thermophilic digestion and bulk land application at the Green Acres Farm:
- Application at the farm should be restricted to 550 wtpd (as per initial estimate for 50-year farm life), unless a different suitable nutrient and metal loading rate is determined for long term sustainability;
- Conduct a detailed evaluation of agronomic uptake rates and groundwater interactions at the farm;
- Identify and implement farm improvements to maximize nutrient uptake, plant yields and revenues, such as addition of gypsum to sodic soils;
- Provide biosolids storage facility at the farm for conditions when spreading is limited by adverse weather or other conditions; and
- Conduct demonstration projects to showcase benefits of biosolids land application and encourage the use of biosolids for non-food farming.
- 2. Implement the TIRE demonstration project to determine true feasibility and costs for renewable energy recovery. If successful it is anticipated that the TIRE facility will be able to treat the equivalent of 200 wtpd digested cake on average, with a maximum capacity of 400 wtpd for a short duration. This will provide diversification with an energy-based biosolids management option, rather than reliance on options that use the nutrient value of biosolids



3. Diversify biosolids management through consideration of other biosolids management options, such as private or City-owned composting or heat drying facilities. Although the current volume of 750 wtpd can be managed with the above two options, management of projected future increases to over 900 wtpd will require additional capacity. For an agency such as the City, which produces large volumes of biosolids, heavy reliance on one management option can contribute to public perception issues and leaves the City more vulnerable to changes in regulations or other factors that may impact costs of a biosolids management option.

## 9.10.2 Biosolids Management Costs

The biosolids management cost projections for the IRP were based on the above recommendations, with 550 wtpd allocated to the Green Acres Farm, 200 wtpd allocated to the TIRE project and the remaining 166 wtpd allocated to an alternative option that may be composting or drying. Costs for thermophilic digestion and dewatering are not included in these costs as they are on-site treatment costs and have been included in the wastewater treatment plant costs. Biosolids management options that reduce the need for onsite treatment (for example, implementation of the TIRE project would eliminate the need for dewatering) may claim a credit for the reduced on-site solids treatment costs. See subsection 9.4 for discussion of 2020 biosolids projections.

O&M costs for the Green Acres Farm were based on information provided by staff at HTP, including estimates for fiscal year 2004/2005 and the estimated cost of the new farm management contract, and are summarized below in Table 9-12. Based on this information, the IRP farm O&M costs were \$28/wt. As the IRP needs to include long-term costs, additional capital costs were included to accomplish other aspects included in the recommendations above, such as a nutrient management study, detailed groundwater monitoring, and gypsum addition.

Table 9-12											
E	Estimated Farm O&N	/I Costs FY 2004/20	05								
ltem	Volume wtpd										
Hauling & spreading	650	\$23.40	\$5,551,650								
Farm management	650	\$9.69	\$2,300,000								
Farm revenue	650	(\$5.73)	(\$1,360,000)								
Total	_	\$27.36									

Table 9-13 provides a high level estimation of these costs. As the scope of this work has not been defined and much will depend on the findings of the nutrient management study, and decisions by the City with regard to aspects such as storage capacity and the type of demonstration programs, the estimates are based primarily



on discussions with staff involved in the 'Review of Biosolids Loading Rates at Green Acres Farm' (CH2M HILL, September 2002).

2020
Cost Estimate
\$300,000
\$500,000
\$100,000
\$100,000
\$125,000
\$175,000
\$1,300,000

\* Store 2 day's cake (density 1,800 lb/cy, pile height 10-ft) - 3,300 sf roofed pad (\$50/sf) w/ 60-ft push wall (\$150/lf).

The TIRE project is being developed by the City in conjunction with Terralog Technologies, who have the technology know-how and who will be operating the facility. Initial proposals by Terralog Technologies to the City provided an O&M cost range of \$15-18/wt. Due to the level of monitoring that will be installed at this facility, and the degree of uncertainty associated with any new application of a technology, City staff agreed that the higher end of this range would be an appropriate planning cost to use. The O&M cost used, therefore, was \$18/wt, with an additional \$4/wt for the HTP biosolids portion to cover hauling.

The City will be contributing some of the capital costs associated with the TIRE demonstration project and future permanent facility, if approved by the EPA and other permitting authorities. The City's portion of the capital costs for the demonstration facility are estimated at \$3.33 million, including provision of piping for liquid biosolids from the TITP digesters to the TIRE facility, and other support facilities. The demonstration project is expected to be conducted for up to 5 years, after which additional costs will be incurred to upgrade to a permanent facility. Preliminary upgrade cost estimates by City staff are for \$5.4 million, with an additional 30 percent contingency. The total City capital cost estimates are therefore \$10.35 million for the next 20 years.

The third biosolids management option is based on the City sending biosolids beyond the capacity of the above options to a regional composting, drying or other facility. An O&M cost of \$55/wt was allocated for this option, as it is most likely that this option would be conducted under a private vendor management contract, since it is unlikely that these types of biosolids management options will be sited at a City wastewater plant. The cost was based on a median of the range of costs that are currently being quoted by private vendors in Southern California for proposed composting and drying projects. Siting and hauling distance will also have an impact on the cost, and



therefore actual costs for different vendors will vary depending on distance to the site. Costs at regional compost facilities, such as the proposed Synagro South Kern Industrial Center facility and the San Joaquin Composting facility, would be expected to be just under \$50/wt, while a drying facility cost would likely be around \$60/wt, depending on hauling distance.

Biosolids management costs projected through 2020 are summarized in Table 9-14. The annualized cost is projected to be \$9.6 million. Key aspects that could impact the actual cost will be the performance of the TIRE project and future decisions regarding diversification to a third management option.

## 9.10.3 Triggers for Change

Biosolids management is a very dynamic area, with changes in regulations, public perception, technologies and costs. The City needs to balance good stewardship of the environment with sound financial management, for which the Biosolids EMS provides the framework. The above strategy provides a cost-effective approach, with diversification into three management options with biosolids products being used for both their nutrient and energy value. However, biosolids management plans also need to provide flexibility to respond to changing situations. Triggers for change that would lead to a re-consideration of the biosolids management strategy include:

- Changes in local county ordinances, particularly Kern County;
- Changes in the Part 503 regulations
- Increasing need for diversification
- Successful demonstration of the TIRE project
- Support for regional biosolids processing facilities



	Table	e 9-14										
Preliminary Cost Estimates for Biosolids Management through 2020												
Option	Volume wtpd	Annual O&M Cost \$/yr	Capital Cost \$									
Farm Costs												
Net Cost	550	\$5,621,000.00	\$1,300,000.00									
TIRE Costs												
TITP	56	\$367,920										
HTP	144	\$1,156,320										
Subtotal	200	\$1,524,240	\$10,350,000									
Other Product Option Cost												
Remainder of total vol.1	166	\$1,666,225										
Total Costs												
Annual O&M		\$8,811,465										
Present Worth O&M Costs		\$109,810,000										
Capital			\$11,650,000									
Total Present Worth	916		\$121,460,000									
Annualized cost			\$9,618,987									

Notes:

Capital Period (years) 20 Interest Rate:5%

<sup>1</sup>. O&M cost based on average production, assuming linear increases till 2020



## Section 10 Alternatives Analysis

## 10.1 Approach

The IRP has identified planning parameters that will result in the need for new programs, infrastructure and facilities to meet the 2020 needs. These planning parameters, or drivers, include population growth, increased wastewater flows, increased dry and wet weather runoff flows, increased demands for drinking water and current and future regulations to protect water quality in the basin. In addition, the IRP has an established set of Guiding Principles to guide future planning, which includes such objectives as producing and using as much recycled water as possible from existing and planned facilities, increasing water conservation and increasing the beneficial use of runoff.

Alternatives are the means of accomplishing the objectives (which include options from each service function). They answer the question, "How are we going to accomplish the objectives?" In the Sections 8 of this document, the potential treatment options (or projects) for meeting these drivers were discussed, and the options for water and runoff were discussed in the Facilities Plan *Volume 2: Water Management* and *Volume 3: Runoff Management* respectively. To meet the 2020 needs, the IRP needed to develop integrated alternatives, which include combinations of wastewater, recycled water and runoff options into complete alternatives. By considering the system using an integrated watershed approach, more holistic alternatives could be identified and evaluated.

As shown in Figure 10-1, the IRP team used a multi-step process to create and evaluate alternatives: (1) develop preliminary alternatives, (2) evaluate preliminary alternatives, (3) refine alternatives and develop hybrid alternatives, (4) evaluate hybrid alternatives and (5) screen to final alternatives for environmental analysis. Additional discussion of the alternatives and the evaluation process is presented in the Facilities Plan *Volume 4: Alternatives Development and Analysis*.

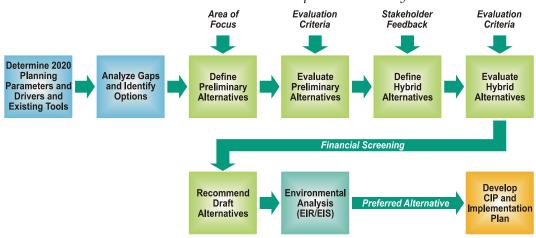


Figure 10-1 IRP Approach to Creating Alternatives



# 10.2 Preliminary and Hybrid Alternatives 10.2.1 Preliminary Alternatives

The first step in creating alternatives was defining preliminary alternatives. Each preliminary alternative was constructed with the different area of focus to reflect tradeoffs:

- *Low cost/minimum requirements:* Alternative includes lower cost solutions to meet minimum requirements
- High beneficial use of water resources: Alternatives offer higher levels of water recycling, conservation and beneficial use of runoff to reduce imported water supplies
- *High adaptability* : Alternatives provide adaptability to respond to changing conditions (e.g., changing flows, technology, or regulations)
- *More decentralized*: Alternative includes more and smaller local projects rather than fewer and larger regional projects.
- *Lower risk*: Alternatives offer relatively lower risk from regulatory or ease-of-implementation perspectives

All preliminary alternatives were constructed to meet current requirements related to regulatory requirements, system capacity, minimum levels of water recycling, beneficial use of runoff, conservation and minimum discharges to the Los Angeles River. Not all of the alternatives, however, are equivalent in meeting potential future regulations. Some alternatives were designed to meet current regulations, some were designed to be flexible to meet new regulations, and some alternatives were designed to meet anticipated regulations.

The detailed analysis of the preliminary alternatives is presented in *Volume 4:* Alternative Development and Analysis. Table 10-1 shows the components of each of the preliminary alternatives. The rows list options available for managing the wastewater, water and runoff systems. The columns show each of the preliminary alternatives. The table can be read by selecting an alternative and reading down the column to see which options are included, and to what level. The cells that are blank indicate that the option listed in that row was not included in the alternative.

The Steering Group played an important role in the development, evaluation and screening of alternatives by providing a "sounding board" throughout the process, giving the necessary feedback to keep the facilities planning efforts aligned with the Guiding Principles. Many Steering Group members elected to completed surveys were used in the decision-making process. For other members, feedback was received via discussion during the workshop sessions through letters, emails, IRP open comment forms, during telephone conversations and individual meetings that were held as part of the workshops follow up activities.



### 10.2.2 Hybrid Alternatives

Based on feedback from the Steering Group, the next step included creating a series of hybrid alternatives. To create the hybrid alternatives, the team sought feedback from the Steering Group and identified key concepts to carry forward. The goal was to create alternatives that combined the best elements of the preliminary alternatives, thereby allowing them to perform better than the original preliminary alternatives. A set of nine hybrid alternatives were created as a result of the analysis of the preliminary alternatives.

The evaluation of the hybrid alternatives and selection of recommended draft alternatives is discussed in *Volume 4: Alternative Development and Analysis*. Table 10-2 shows the components of each of the hybrid alternatives. The rows list the options available for managing the wastewater, water and runoff systems. The columns show the hybrid alternatives. The table can be read by selecting an alternative and reading the column for options included and to their level. The cells that are blank indicate that the option listed in that row was not included in the alternative.

These nine hybrid alternatives were then analyzed by comparing their estimated costs with their expected wastewater management, recycled water, dry weather urban runoff and wet weather urban runoff benefits. A limited number of recommended draft alternatives were then selected for detailed environmental analysis, and are described in this section. A preferred alternative will be selected in the EIR analysis.

## 10.3 Wastewater Management Projects in Recommended Draft Alternatives

After an intensive process that was based on stakeholder preferences, 21 initial alternatives were narrowed to four alternatives that will meet the wastewater infrastructure needs of the population of 2020. They will maximize the beneficial use of recycled water and urban runoff, optimize the use of our existing facilities and water resources, reduce pollution and minimize our dependency on imported water. The wastewater portion of the alternatives is described in the sections that follow. A detailed description of the components of these alternatives is presented in *Volume 4:* Alternatives Development and Analysis. The recommended draft alternatives include:

- Alternative 1: Hyperion Water Treatment Plant expansion with high potential for water resources projects (Hyb1C)
- Alternative 2: Tillman and LAG Water Replenishment Plant expansions with high potential for water resources projects (Hyb2C)
- Alternative 3: Tillman Water Replenishment Plant expansion with moderate potential for water resources projects (Hyb3B)
- Alternative 4: Tillman Water Replenishment Plant expansion with high potential for water resources projects (Hyb3C)



Column		Low Cost/Min. Requirements (LCMR)		ligh Be	neficial Us	e of Wate	Resour	Resources (WR)		gh Adaptability (HA)		More De- centralized (MD)	Low Ri	isk (L
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Divert - inland (Dominguez Channel 16 mgd)	Divert - inland (Ballona Creek 3.3 mgd)										土			
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X	On-site percolation (infiltration trenches/basins, reduce paving/hardscape)		П		· ·						$oldsymbol{\mathcal{I}}$			
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ercent of Representative storm (1/2-inch) managed (of citywide 1,700 mgd)  10%  48%  48%  58%  58%  58%  58%  39%  39%  39%  55%  100%  rent/Anticipated Regulations Level of Compliance  Alifornia Toxics Rule  Yes  Yes  Yes  Yes  Yes  Yes  Yes  Y	3. (	X		Χ	<b>A</b>	X	X	٨	X	X	+	٨		
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rage for daily (diurnal) peaks	Laro Total Maximum Bally Loads (projection)			_					-				-	

Low Cost/Minimum Requirements: alternative includes lower cost solutions or low initial investment by meeting minimum requirements.

High Beneficial Use of Water Resources: alternatives that include high levels of recycled water, conservation, and beneficial use of runoff that reduces use of imported water.

High Adaptability: alternatives that are most able to adjust to changing conditions, such as population, wastewater flows and regulations.

More Decentralized: alternatives with solutions based on many small-scale projects centered on small neighborhoods, households or even individuals, rather than fewer and larger regional projects.

Lower Risk: alternatives that are lower in risk from a regulatory perspective (LR1) or in terms of ease of implementation from a technical, environmental and/or political and public acceptance perspective (LR2).

### Table 10-2 City of Los Angeles

Integrated Resources Plan (IRP) - Hybrid Alternatives Matrix

1	1 Option		WR3a	HA1	LR1	LR1 Hyb1A Hyb1B Hyb1C Hyb2A Hyb2B Hyb2C Hyb					Hyb3A	Hyb3B	Hyb3C	
2	Wastewater Treatment Tillman - Upgrade treatment (64 mgd) (Advanced Treatment)	64 mgd	64 mgd		64 mgd	64 mgd	64 mgd	64 mgd						
4	Tillman - Upgrade and increase capacity to 80 mgd (Advanced Treatment) Tillman - Upgrade and increase capacity to 100 mgd (Advanced Treatment)			80 mgd					80 mgd	80 mgd	80 mgd	100 mgd	100 mgd	100 mgd
6	Tillman - Upgrade and increase capacity to 120 mgd (Advanced Treatment)													
7 8	Los Angeles-Glendale - Maintain existing capacity (15 mgd) (Title 22)  Los Angeles-Glendale - Increase capacity to 20 mgd (Title 22)	15 mgd				15 mgd	15 mgd	15 mgd				15 mgd	15 mgd	15 mgd
9	Los Angeles-Glendale - Increase capacity to 30 mgd (Title 22)  Los Angeles-Glendale - Upgrade treatment (15 mgd) (Advanced Treatment)		30 mgd		15 mgd									
12	Los Angeles-Glendale - Upgrade and increase capacity to 30 mgd (Advanced Treatment)			30 mgd	15 mga				30 mgd	30 mgd	30 mgd			
13	New Reclamation Plant - Build 10 mgd capacity near downtown (Title 22)  New Reclamation Plant - Build 30 mgd capacity in valley (Title 22)		30 mgd											
15 16	New Reclamation Plant - Build 10 mgd capacity near downtown (Advanced Treatment)  New Reclamation Plant - Build 30 mgd capacity in valley (Advanced Treatment)													
17	Hyperion - Maintain existing capacity (450 mgd)			450 mgd					450 mgd	450 mgd	450 mgd	450 mgd	450 mgd	450 mgd
18 19	Hyperion - Increase capacity to 500 mgd  Hyperion - Increase capacity to 550 mgd	500 mgd	500 mgd		550 mgd	500 mgd	500 mgd	500 mgd						
20	Total Effective Hyperion Service Area Treatment Capacity <sup>2</sup> (mgd)	546	546	529	607	546	546	546	529	529	529	521	521	521
21	Terminal Island - Maintain existing capacity (30 mgd) Wastewater Sewer System	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd	30 mgd
23 24	Build new interceptor sewer - Valley Spring Lane Interceptor Sewer  Build new interceptor sewer - Glendale Burbank Interceptor Sewer (GBIS)	X	X	X	X	Х	Х	X	Х	X	X	X	Х	X
25	Build new interceptor sewer - North East Interceptor Sewer (NEIS) Phase 2	X	X	X	X	X	X	X	X	X	X	X	X	X
26 27	Build new interceptor sewer - for New Plant (10 mgd - 2 miles)  Build new interceptor sewer - for New Plant (30 mgd - 2 miles)		Х											
28	Build new buried storage tank - 60 MG at Tillman <sup>3</sup> Build new buried storage tank - 10 MG at Los-Angeles Glendale			_ X		X X*	X X*	X X*	X X*	- X X*	X X*	X X*	X X*	X X*
29	Build new buried storage tank - 20 MG at Los-Angeles Glendale		X*	Х*					_ ^		_ ^		^	
30 31	Build new buried storage tank - 10 MG at new plant Build new buried storage tank - 20 MG at new plant		X*											
32 33	Recycled Water (Non-Potable Demands)  Meet Los Angeles River minimum requirements using treated wastewater	Х	Х	X	Х	Х	Х	Х	Х	Х	Х	Х	X	X
34	Meet Irrigation/Industry demands using treated wastewater	X	X	X	Low	X	X	X	X	X	X	X	X	X
37 39	Recharge groundwater basin using treated wastewater  Meet Irrigation/Industry demands using treated runoff (low/medium/high)						Low	Low		Low	Low		Low	Low
42	Recharge groundwater basin using treated runoff  Conservation Programs		High											
44	Increase conservation efforts to DWP's planned 2020 levels	Х	X	X	X	Х	X	X	X	X	X	X	X	X
	Increase conservation efforts further Dry Weather Urban Runoff		X	X			X	X		X	X		X	X
47	Local/Neighborhood Solutions Smart Irrigation		X	X			X	X		X	X		X	X
49	Increase public education and participation	Х	X	X	Х	X	X	X	Х	X	X	Х	X	X
50	Regional Solutions Diversion to Wastewater System (WW) or													
51 52	Divert to Urban Runoff Plant or wetlands and Beneficially Use (URP) <sup>1</sup> Divert - coastal (10 mgd)	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW	WW
53	Divert - inland (Bell Creek 2.8 mgd)	7777	*****	V V V	WW	7777	***************************************		*****	7777		V V V	*****	
54 55	Divert - inland (Browns Creek 3 mgd) Divert - inland (Aliso Wash 1.8 mgd)				WW			WW			URP <sup>4</sup>			URP⁴
56	Divert - inland (Wilbur Wash 1 mgd)				WW			WW			URP <sup>4</sup>			URP <sup>4</sup>
57 58	Divert - inland (Limekiln Canyon 1.5 mgd)  Divert - inland (Caballero Canyon 1mgd)				WW			WW			URP⁴ URP⁴			URP⁴ URP⁴
59	Divert - inland (Bull Creek 2.4 mgd)				WW			WW			URP <sup>4</sup>			URP <sup>4</sup>
60	Divert - inland (Tujunga Wash 6 mgd) Divert - inland (Pacoima Wash 7 mgd)				WW			WW			URP <sup>4</sup>			URP <sup>4</sup>
62 63	Divert - inland (Arroyo Seco 5 mgd) Divert - inland (Reach 3 LAR 4 mgd)				WW WW									
64	Divert - inland (Reach 2 LAR-12 mgd)				WW									
65 66	Divert - inland (Burbank Western Channel 1.8 mgd) Divert - inland (Compton Creek 2.6 mgd)				WW		URP	URP		URP	URP		URP	URP
67 68	Divert - inland (Ballona Creek 3.3 mgd)  Divert - inland (Sepulveda Channel 16 mgd)				WW		URP	URP		URP	URP		URP	URP
69	Divert - inland (Dominguez Channel 16 mgd)				WW									
73 75	Percent of Dry Weather Runoff Managed (of watershed - 97 mgd)  Wet Weather Urban Runoff	10%	21%	21%	100%	10%	26%	42%	10%	26%	42%	10%	26%	42%
76 77	Local/Neighborhood Solutions  New/Redevelopment Areas - On-site treatment/discharge	X	Х	Х	X	X	Х	X	X	X	X	X	X	Х
78	New/Redevelopment Areas - On-site percolation	X	X	X	X	X	X	X	X	X	X	X	X	X
79 80	Retrofit Areas - Cisterns (On-site storage/use) Residential		Х											
81 82	Schools Government		X					X			X			X
83	On-site percolation (infiltration trenches/basins, reduce paving/hardscape)													
84 85	Residential Schools		X					Х			Х			X
86 87	Government Commercial		X					Х			Х			Х
88	Rec/Cemetaries Neighborhood recharge		Х											
90	Vacant Lots (East Valley) (Low/Medium/High)		Low	High			High	Med		High	Med		High	Med
91 92	Parks/Open Space (East Valley) (Low/Medium/High) Abandoned Alleys (East Valley) (Low/Medium/High)		Low Low	High High			High High	Med Med		High High	Med Med		High High	Med Med
102 106	Regional Solutions Non-urban regional recharge		High					Med			Med			Med
107	Runoff treatment and beneficial use/discharge Treat and beneficial use/discharge (coastal area)	X	X	X	X	X	X	X	X	X	X	X	X	X
109	Treat and beneficial use/discharge (all areas)				Х									
110 111	Percent of Representative storm (1/2-inch) managed (of citywide 1,700 mgd)  Current/Anticipated Regulations Level of Compliance	10%	58%	39%	100%	10%	39%	47%	10%	39%	47%	10%	39%	47%
112	California Toxics Rule	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
113 114	Current Total Maximum Daily Loads (TMDLs) - Bacteria (Santa Monica Bay), Trash Future Total Maximum Daily Loads (projection)	Yes No	Yes Partial	Yes Partial	Yes Yes	Yes No	Yes Partial	Yes Partial	Yes Partial	Yes Partial	Yes Partial	Yes Partial	Yes Partial	Yes Partial
	Notes: *Storage for daily (diurnal) peaks													
117	Flows indicated assume no smart irrigation. Implementing smart irrigation citywide would r		dry weath	er runoff es	stimates by	y ~11 mgd								
118 119	<sup>2</sup> Effective Capacity is the total treatment capacity, minus solids and brine return flows to the <sup>3</sup> Includes new GBIS extension from NOS to GBIS.	sewer												
120	<sup>4</sup> Runoff is treated and discharged. Runoff can potentially be treated and beneficially used if	future den	nands are i	dentified.										
122	Definitions: LCMR - Low Cost/Minimum Requirements: alternative includes lower cost solutions or low i													
	WR - High Beneficial Use of Water Resources: alternatives that include high levels of recycl HA - High Adaptability: alternatives that are most able to adjust to changing conditions, such													
125	LR - Lower Risk: alternatives that are lower in risk from a regulatory perspective (LR1) or in													
126	environmental and/or political and public acceptance perspective (LR2).													

## 10.3.1 Alternative 1 (Hyperion Expansion/Moderate Potential for Water Resources Projects)

The wastewater system for Alternative 1 includes expanding Hyperion to 500 mgd, upgrading Tillman to advanced treatment with no expansion and providing collection system improvements. Refer to the *Volume 4: Alternatives Development and Analysis* for a detailed description of the components of each of the alternatives.

The wastewater system options are used as the basis of each alternative, and the water and runoff management options were selected and combined to create a complete alternative. Following is a summary of the wastewater treatment options included in Alternative 1:

- Maintain existing capacity of 64 million gallons per day (mgd) at the Donald C. Tillman Water Reclamation Plant (Tillman). Upgrade Tillman to advanced treatment (assumed reverse osmosis) to meet assumed future regulatory requirements for Los Angeles River discharge.
- Maintain existing capacity of 15 mgd at the Los Angeles Glendale Water Reclamation Plant (LAG) and Title 22 level of treatment. It is assumed that LAG does not discharge to Los Angeles River. Add 5 million gallon (MG) of storage to equalize variations in daily flows and 5 MG for recycled water storage
- Expand the Hyperion Treatment Plant (Hyperion) to 500 mgd by adding secondary clarifiers and digesters.

For wastewater conveyance, the following options were included in Alternative 1:

- Build new Glendale Burbank Interceptor Sewer (GBIS) between Toluca Lake and LAG.
- Build new North East Interceptor Sewer (NEIS) Phase 2, located south of LAG.
- Build new 60 MG buried wet weather storage tank with Real-Time Control at Tillman
- Build new Valley Spring Lane Interceptor Sewer (VSLIS) between Tillman and Toluca Lake.

As stated above, each of these options is detailed in Sections 8 of this document, as well as in *Volume 4: Alternatives Development and Analysis*. As the recommended draft alternatives were selected from the hybrid alternatives, Alternative 1 was formerly called Alternative Hyb1C, therefore refer to Table 10-2 to see which options were included in the alternative.

Alternative 1 includes wastewater treatment and conveyance projects required to expand Hyperion to 500 mgd and upgrade Tillman to advanced treatment by year 2020. It focuses on maximizing the use of existing process capacity at the Hyperion



Treatment Plant. Existing capacity upstream in the system would be maintained. Tillman would be upgraded to advanced treatment to allow continued discharge of at least 30 mgd to the Los Angeles River. LAG would be maintained as a Title 22 plant. A higher percentage of wastewater than other alternatives would be conveyed to Hyperion requiring an expansion to 500 mgd by increasing the capacities of secondary clarifiers and digesters only. Table 10-3 presents a summary of the wastewater treatment components included in Hybrid Alternatives Alternative 1.

Table 10-3 Alternative 1 Wastewater Treatment Components									
	Hydraulic Capacity (mgd)			Level of Treatment (Effluent)					
Component	Current	Add'l	Total	Current	New				
				Title 22 with					
Donald C. Tillman Water				Nitrification &	Advanced				
Reclamation Plant	64 mgd	0 mgd	64 mgd	Denitrifcation <sup>1</sup>	Treatment <sup>2</sup>				
				Title 22 with	Title 22 with				
				Nitrification &	Nitrification &				
LAG Water Reclamation Plant	15 mgd	0 mgd	15 mgd	Denitrifcation	Denitrifcation				
Hyperion Treatment Plant	450 mgd	50 mgd	500 mgd	Secondary	Secondary				
Total Hyperion Service Area			546 mgd <sup>3</sup>						
				Advanced	Advanced				
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Treatment	Treatment				

#### Notes:

Alternative 1 would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors and storage facilities would be required as described below:

- Build new Glendale Burbank Interceptor Sewer (GBIS) between Toluca Lake and LAG
- Build new North East Interceptor Sewer (NEIS) Phase 2, located south of LAG
- Build new Valley Spring Lane Interceptor Sewer (VSLIS) between Tillman and Toluca Lake



As discussed in the Wastewater Management Volume, for the IRP it was assumed that the nitrification/denitrifcation projects currently under construction will result in a reduction of total capacity at Tillman by 20 percent (from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 25 percent (from 20 mgd to 15 mgd).

<sup>2.</sup> For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).

<sup>3.</sup> The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For the Hyb1 series, the effective capacity is 46 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 500 mgd at Hyperion = 546 mgd.

It is assumed that Title 22 plants will provide no capacity relief to the sewer system, since there will be no discharge out of the system other than through service to recycled water end users. During wet weather, these end users may not require recycled water (e.g., for irrigation use), so the entire flow through LAG would be returned to the sewer system for conveyance downstream to Hyperion. Therefore, LAG as a Title 22 plant will not provide any relief to the sewer system during wet weather.

For biosolids management, Alternative 1 assumes 100 percent beneficial reuse of Class A exceptional quality (EQ) biosolids through land application.

## 10.3.2 Alternative 2 (Tillman and LAG Water Reclamation Plant Expansion/High Potential for Water Resources Projects)

The wastewater system for Alternative 2 includes expanding Tillman to 80 mgd with advanced treatment and expanding LAG to 30 mgd with advanced treatment as well as collection system improvements. Refer to the *Volume 4: Alternatives Development and Analysis* for a detailed description of the components of each of the alternatives.

The wastewater system options are used as the basis of each alternative, and the water and runoff management options were selected and combined to create a complete alternative. Following is a summary of the wastewater treatment options included in Alternative 2:

For wastewater treatment, the following options were included in Alternative 2:

- Expand Tillman from 64 mgd (assumed existing capacity) to 80 mgd. Upgrade Tillman to advanced treatment (assumed reverse osmosis) to meet assumed future regulatory requirements for Los Angeles River discharge.
- Expand LAG capacity from 15 mgd to 30 mgd and upgrade to advanced treatment (assumed reverse osmosis) to meet assumed future regulatory requirements for Los Angeles River discharge. It is also assumed that a 5 MG tank would be constructed at LAG for equalization and a 5 MG tank for recycled water storage.
- Add secondary clarifiers and digesters at Hyperion.

For wastewater conveyance, the following options were included in Alternative 2:

- Build new Glendale Burbank Interceptor Sewer (GBIS) between Toluca Lake and LAG.
- Build new North East Interceptor Sewer (NEIS) Phase 2, located south of LAG.
- Build new 60 MG buried wet weather storage tank with Real-Time Control at Tillman



 Build new Valley Spring Lane Interceptor Sewer (VSLIS) between Tillman and Toluca Lake.

As stated above, each of these options are detailed in Sections 8 of this document, as well as in *Volume 4: Alternatives Development and Analysis*. As the recommended draft alternatives were selected from the hybrid alternatives, Alternative 2 was formerly called Alternative Hyb2C, therefore refer to Table 10-2 to see which options were included in the alternative.

Alternative 2 includes maintaining the current wastewater treatment at Hyperion, expanding the conveyance system, and upgrading the Tillman and the Los Angeles-Glendale Plant to advanced treatment. Alternative 2 focuses on maximizing the use of the existing process capacity at the Hyperion Treatment Plant near El Segundo while expanding upstream. Tillman will be expanded to a capacity of 80 mgd and upgraded to advanced treatment while still continuing to discharge at least 30 mgd to the Los Angeles River. LAG will be expanded to a capacity of 30 mgd and upgraded to advanced treatment.

Table 10-4 presents a summary of the wastewater treatment components included in Alternative 2. For biosolids management, Alternative 2 assume 100 percent beneficial reuse of Class A EQ biosolids through land application.

Table 10-4 Alternatives 2 Wastewater Treatment Components									
	Hydr	aulic Capacity (r	Level of Treatment (Effluent)						
Component	Current	Add'l	Total	Current	New				
Donald C. Tillman Water Reclamation Plant	64 mgd	16 mgd	80 mgd	Title 22 with Nitrification & Denitrifcation <sup>1</sup>	Advanced Treatment <sup>2</sup>				
LAG Water Reclamation Plant	15 mgd	15 mgd	30 mgd	Title 22 with Nitrification & Denitrification	Advanced Treatment				
Hyperion Treatment Plant	450 mgd	0 mgd	450 mgd	Secondary	Secondary				
Total Hyperion Service Area			529 mgd <sup>3</sup>						
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment				

#### Notes:



As discussed in the Wastewater Management Volume, for the IRP it was assumed that the nitrification/denitrification projects currently under construction will result in a reduction of total capacity at Tillman by 20 percent (from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 25 percent (from 20 mgd to 15 mgd).

For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).

The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For the Hyb2 series, the effective capacity is 46 mgd at Tillman + 22 mgd at LAG + 450 mgd at Hyperion = 529 mgd.

## 10.3.3 Alternative 3 and 4 (Tillman Water Reclamation Plant Expansion / Moderate Potential for Water Resources Projects)

The wastewater system for Alternative 3 and Alternative 4 are identical, and include expanding Tillman to 100 mgd with advanced treatment, and providing collection system improvements. The differences in this alternative lie in the water and runoff components of the alternative. Refer to *Volume 4: Alternatives Development and Analysis* for a detailed description of the components of each of the alternatives.

The wastewater system options are used as the basis of each alternative, and the water and runoff management options were selected and combined to create a complete alternative. Following is a summary of the wastewater treatment options included in Alternative 3 and Alternative 4:

For wastewater treatment, the following options were included in Alternative 3 and Alternative 4:

- Expand Tillman from 64 mgd (assumed existing capacity) to 100 mgd and upgrade to advanced treatment (assumed reverse osmosis) to meet assumed future regulatory requirements for Los Angeles River discharge.
- Maintain existing capacity of 15 mgd at LAG with Title 22 level of treatment. To equalize variations in daily flows and provide storage or recycled water, approximately 10 MG of storage is assumed to be included at LAG.
- Add secondary clarifiers and digesters at Hyperion.

For wastewater conveyance, the following options were included in Alternative 3 and Alternative 4:

- Build new Glendale Burbank Interceptor Sewer (GBIS) between Toluca Lake and LAG.
- Build new North East Interceptor Sewer (NEIS) Phase 2, located south of LAG.
- Build new 60 MG buried wet weather storage tank with Real-Time Control at Tillman
- Build new Valley Spring Lane Interceptor Sewer (VSLIS) between Tillman and Toluca Lake.

As stated above, each of these options are detailed in Sections 8 of this document, as well as in *Volume 4: Alternatives Development and Analysis*. As the recommended draft alternatives were selected from the hybrid alternatives, Alternative 3 was formerly called Alternative Hyb3B and Alternative 4 was formerly called Alternative Hyb3C, therefore refer to Table 10-2 to see which options were included in the alternative.



Alternative 3 and Alternative 4 include wastewater treatment and conveyance projects required to upgrade Tillman to advanced treatment by year 2002. Alternative 3 and Alternative 4 focus on upgrading Tillman while maximizing the use of existing process capacity at Hyperion. LAG will also remain unchanged as a Title 22 plant. Tillman would be upgraded to advanced treatment to allow continued discharge of at least 30 mgd to the Los Angeles River. Table 10-5 presents a summary of the wastewater treatment components included in Alternative 3 and Alternative 4.

Table 10-5						
Alternative 3 and Alternative 4						
,	Wastewater	Treatment	Componer	nts		
	Hydrau	lic Capacit	y (mgd)	Level of Trea	tment (Effluent)	
Component	Current	Add'l	Total	Current	New	
Donald C. Tillman Water Reclamation Plant	64 mgd	36 mgd		Title 22 with Nitrification & Denitrifcation <sup>1</sup>	Advanced Treatment <sup>2</sup>	
	45	0 1		Title 22 with Nitrification &	Title 22 with Nitrification &	
LAG Water Reclamation Plant	15 mgd	0 mgd	- 3-	Denitrifcation	Denitrifcation	
Hyperion Treatment Plant	450 mgd	0 mgd	450 mgd	Secondary	Secondary	
Total Hyperion Service Area			521 mgd <sup>3</sup>			
Terminal Island Treatment Plant	30 mgd	0 mgd	30 mgd	Advanced Treatment	Advanced Treatment	

#### Notes:

Alternative 3 and Alternative 4 would also require additional wastewater conveyance (sewer) capacity to convey flows downstream to Hyperion. To relieve the system capacity and prevent spills during wet weather in the year 2020, new interceptors or storage facilities would be required including, GBIS, NEIS Phase 2, and VSLIS or storage.

It is assumed that Title 22 plants will provide no capacity relief to the sewer system, since there will be no discharge out of the system other than through service to recycled water end users. During wet weather, these end users may not require recycled water (e.g., for irrigation use), so the entire flow through LAG would be returned to the sewer system for conveyance downstream to Hyperion. Therefore, LAG as a Title 22 plant will not provide any relief to sewer system during wet weather.

For biosolids management, Alternative 3 and Alternative 4 assume 100 percent beneficial reuse of Class A EQ biosolids through land application.



<sup>1</sup> As discussed in the Wastewater Management Volume, for the IRP it was assumed that the nitrification/denitrification projects currently under construction will result in a reduction of total capacity at Tillman by 20 percent (from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 25 percent (from 20 mgd to 15 mgd).

<sup>2.</sup> For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).

<sup>3.</sup> The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For the Hyb3 series, the effective capacity is 71 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 450 mgd at Hyperion = 521 mgd.

# 10.3.4 Leadership Projects

In addition to each of the options included in the alternatives, for each series of alternatives, leadership projects were identified where there was a need for further investigation on the technicalities, implementability, constraints, effectiveness, etc. of the option prior to full scale implementation. See *Volume 4: Alternatives Development and Analysis* for additional discussion on leadership projects.

# **10.3.5 Alternative Summary**

The following Table 10-6 summarize the components of each of the draft alternatives. Figure 10-2 shows the lifecycle costs for each of the recommended draft alternatives. See *Volume 4: Alternatives Development and Analysis* for detailed discussion of alternatives.

			Table 10-6					
		Altern	atives 1, 2, 3, and	4				
		Summary of Wastewa	ter Treatment Con	ponents by 2020				
	Existing Alternative 1 Alternative 2 Alternative 3 & 4							
Tillman	Capacity	64 mgd	64 mgd	80 mgd	100 mgd			
	Level of treatment	Title 22 with Nitrification & Denitrifcation <sup>1</sup>	Advanced Treatment <sup>2</sup>	Advanced Treatment <sup>2</sup>	Advanced Treatment <sup>2</sup>			
LAG	Capacity	15 mgd	15 mgd	30 mgd	15 mgd			
	Level of treatment	Title 22 with Nitrification & Denitrification	Current + added diurnal storage	Advanced Treatment <sup>3</sup>	Current + added diurnal storage			
Hyperion	Capacity	450 mgd	500 mgd	450 mgd	450 mgd			
	Level of treatment	Secondary	Current + new digesters	Current + new digesters	Current + new digesters			
Total Hype	erion Service	Area Capacity	546 mgd <sup>3</sup>	529 mgd⁴	521 mgd <sup>5</sup>			
Terminal	Capacity	30mgd	30 mgd	30 mgd	30 mgd			
Island	Level of treatment	Advanced Treatment	Advanced Treatment	Advanced Treatment	Advanced Treatment			

<sup>&</sup>lt;sup>5</sup> The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For Alternative 3 and 4, the effective capacity is 71 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 450 mgd at Hyperion = 521 mgd.

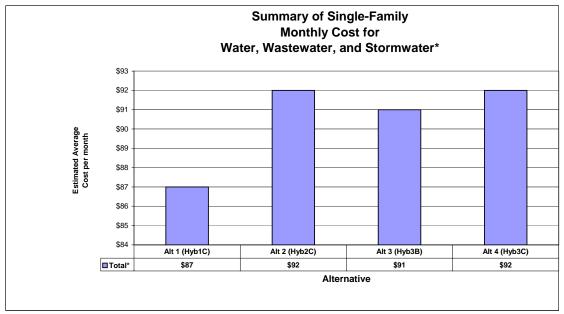


<sup>&</sup>lt;sup>1</sup> As discussed in *Volume 1: Wastewater Management*, for the IRP it was assumed that the nitrification/denitrification projects currently under construction will result in a reduction of total capacity at Tillman by 0 to 20 percent (assumed 20 percent, from 80 mgd to 64 mgd) and a reduction of total capacity at LAG by 0 to 25 percent (assumed 25 percent, from 20 mgd to 15 mgd).

<sup>&</sup>lt;sup>2</sup> For the IRP, the team assumed that Tillman would be upgraded to advanced treatment using microfiltration/reverse osmosis (MF/RO) to meet future discharge requirements for the Los Angeles River based on the California Toxics Rule (CTR).

<sup>&</sup>lt;sup>3</sup> The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For Alternative 1, the effective capacity is 46 mgd at Tillman + 0 mgd at LAG (since during wet weather LAG would discharge to the sewer) + 500 mgd at Hyperion = 546 mgd.

<sup>&</sup>lt;sup>4</sup> The effective capacity represents the total influent capacity minus the return solids flow and minus the return brine flow (if applicable). For Alternative 2, the effective capacity is 46 mgd at Tillman + 22 mgd at LAG + 450 mgd at Hyperion = 529 mgd.



Benefits				
	Alt 1 (Hyb1C)	Alt 2 (Hyb2C)	Alt3 (Hyb3B)	Alt4 (Hyb3C)
Additional Recycled Water Usage (AF/yr)	38,700	49,900	40,100	52,800
DWUR Managed (% of watershed - 97 mgd)	42%	42%	26%	42%
WWUR Managed (% of citywide 1,700 mgd)	49%	49%	40%	49%
DWUR and WWUR Beneficially Used (AF/yr)	37,700	37,700	32,500	37,700
Positive Impacts on Public Lands (acres)	353	353	580	353

\*Does not include baseline CIP costs, new costs for future TMDLs (except LR1), or budget for leadership projects.

#### Acronyms

DWUR- Dry Weather Urban Runoff WWUR-Wet Weather Urban Runoff AF/yr- Acre-feet per year MGD- Million gallons per day LAG-Los Angeles-Glendale

Figure 10-2 Summary of Lifecycle Costs



# 10.4 Summary

Through working with the Steering Group, various City departments and staff, the IRP has taken numerous water, wastewater and runoff options and created comprehensive alternatives. The preliminary alternatives were evaluated and improved upon to create the hybrid alternatives, and the hybrid alternatives were then evaluated to determine the best, or recommended draft alternatives. From this, the environmental analysis will be conducted on each of these four alternatives to determine the final alternative that will be implemented by the City. The components of this alternative will be fine tuned through the implementation of leadership projects that will better define which pieces work and which need to be improved upon prior to full scale implementation. The details of the final alternative and the CIP can be found in *Volume 5: Adaptive Capital Improvement Program*.



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# Appendix A Regulatory Forecast



# **Technical Memorandum:** Regulatory Forecast

To: Chuck Turhollow, City of Los Angeles, Bureau of Sanitation

Project Manager, Los Angeles Integrated Resources Plan

From: Paul Gustafson, CH:CDM

Project Manager

Michele Plá, CH:CDM

Regulatory Expert, Facilities Planning Team

Date: May 15, 2003

#### **Abstract:**

This technical memorandum identifies and summarizes the priority regulations and key policy issues that the City of Los Angeles must address in developing forward planning strategies. The memorandum will: (1) discuss the process of updating the regulatory forecast and the criteria for identifying priority regulations and key policy issues; (2) present the updated regulatory forecast; and (3) provide a summary of the key policy issues. Following this memorandum, sessions will be conducted with the City and the consultant team to develop appropriate environmental goals to meet the forecast.

# **Introduction and Purpose**

Understanding the regulatory forecast and developing appropriate environmental quality goals are essential steps in the facilities planning process. For the Integrated Resources Plan (IRP), the overall approach the facilities planning team used to develop the forecast and associated goals is as follows:

- Update the forecast tables generated in Phase I [Integrated Plan for the Wastewater Program (IPWP)], and expand to include anticipated schedule.
- Interview senior staff to update "key policy issues."
- Prepare technical memorandum summarizing the anticipated regulatory forecast.
- Conduct sessions with City and consultant team to develop appropriate environmental goals to meet the forecast.



The purpose of this memorandum is to summarize the anticipated regulatory forecast and identify key policy issues. The resulting environmental goals will be discussed in a separate document.

# **Updated Forecast Tables**

In the IPWP, regulations and policies affecting the wastewater and stormwater programs were summarized in two documents: "Pertinent Regulatory Requirements and Key Policy Issues Technical Memorandum" (April 2000) and the "Stormwater Quality Management Technical Memorandum" (April 2001).

The priority regulations and key policy issues for stormwater, pretreatment; collection system management; wastewater treatment and operations; water recycling; air quality; biosolids management; and construction were summarized using four categories:

- **Current policies and regulations:** those which are in place and are part of a permit, order, or other enforceable tool.
- **Emerging policies and regulations**: those which are adopted, but <u>not yet</u> included in a permit, order or other enforceable tool.
- **Proposed policies and regulations**: those which are in various development stages, but <u>not</u> yet adopted.
- "Crystal Ball" policies and regulations: issues that have the potential of becoming proposed, emerging or current in the future. In developing these stages, and in applying them to specific regulations, the staff and consultants based their opinions on experience, communication within industry and regulatory agency leaders, and understanding of the regulatory environment in which the City's programs operate.

Because the IPWP documents were generated almost 2 years ago, the first step was to update the tables to:

- Identify if any of the requirements or policies or their phasing have been changed or eliminated (e.g., have we seen changes from proposed to current, do we have new crystal ball regulations)
- Test if the criteria for what is considered a key issue has changed in any way
- Identify to what extent the schedule for these key policy issues (when we expect them to truly impact the City's programs) has changed.

In addition, a similar table was generated for constructed wetlands.



The first step in this update was a review with the City of Los Angeles Bureau of Sanitation Regulatory Affairs Division staff of the complete list of tables that were prepared in the two Phase I documents. This review resulted in a number of deletions and additions of regulations, as well as many changes of the phase of the regulations. Not surprisingly, many regulations or policies that were proposed are now in the emerging phase, and some that were emerging a few years ago are now current.

The next step was to interview managers and key senior staff at the Bureau of Sanitation, Department of Water and Power, and the City Attorney's Office to discuss the revised forecast tables and get their feedback on what the resulting key policy issues are. The list of staff that have contributed to this effort is in Attachment A.

From information generated in those two steps, the regulatory forecast tables could be updated. Attachment B includes Tables B1 through B12, which summarize the updated regulatory forecast in the following order:

- Pretreatment (Table B1)
- Wastewater Collection System Management (Table B2)
- Wastewater Treatment and Operations Donald C. Tillman Water Reclamation Plant (Table B3)
- Wastewater Treatment and Operations LA-Glendale Water Reclamation Plant (Table B4)
- Wastewater Treatment and Operations Hyperion Treatment Plant (Table B5)
- Wastewater Treatment and Operations Terminal Island Treatment Plant (Table B6)
- Water Recycling (Table B7)
- Air Quality (Table B8)
- Biosolids Management (Table B9)
- Stormwater Runoff Management (Table B10)
- Construction Permits (Table B11)
- Constructed Wetlands (Table B12)

There are links and relationships between these priority regulations and key policy issues and those relationships are discussed below. This information is valuable to guide the development of environmental goals, which in turn, will play a major role in the alternative



analyses for the IRP Facilities Plan, which includes wastewater, stormwater runoff, and water recycling facilities.

# **Identifying Priority Issues**

As shown in the regulatory forecast tables in Attachment B, there are many potential regulatory and/or policy issues that could affect the City. To allow for effective facilities planning, the IRP must focus on developing options/management approaches to address those issues considered a priority. During Phase I, a set of criteria was developed to help identify and focus on the priority issues. Consequently, in viewing the breath and scope of the regulations that impact the City and that must be accounted for in developing a Facility Plan, the criteria originally developed during Phase I have been applied using the collective judgment and expertise of the staff interviewed (the City, County, and Regional Water Quality Control Board) and the consultant team. In each case, the intention has been to highlight the regulation or policy so that it is accounted for and considered in the course of developing alternatives for the IRP.

#### **Criteria**

To determine what regulatory issues in the forecast should be considered a priority, the IRP team developed the following criteria:

- Requires extraordinary resources to resolve
- Could cause damage to the City's prestige or reputation
- Requires a fundamental shift in how the program operates
- Requires legal action

#### **Requires Extraordinary Resources to Resolve**

This category is defined as a regulation or policy that would require:

- Money that has not been budgeted or cannot be easily absorbed in the annual operating or capital budget, thus requiring raising funds; or
- The use of funds that were planned for other essential items, thus changing the priorities of the program and either delaying other essential work or requiring a rate increase in order to do all essential work; or
- Significant amounts of money, without having a measurable environmental benefit; or
- An extraordinary level of effort in organizing community or political opinion/action (consultants, lobbyists, public information effort, time spent on this issue rather than other issues).



#### **Could Cause Damage to Prestige or Reputation of the Agency**

This category is defined as a regulation or policy that:

- Has strong public appeal; or
- Is of central concern to interest groups and could result in citizen lawsuits, and negative publicity; or
- Has strong political support and is high priority for the United States Environmental Protection Agency (EPA), the President, the Governor, legislatures, or elected officials so that regulators will pay very close attention to its implementation; or
- Is the subject of a national or state enforcement policy; or
- If not responded to can result in consistent and continued negative publicity for the program and the City; or
- Requires local, regional, or national leadership to resolve; or
- Would have negative economic impacts on the City or the region.

#### **Requires a Fundamental Shift in How the Program Operates**

This category is defined as a regulation or policy that would require:

- A new approach for the program or taking on new responsibility that has not previously been contemplated; or
- A different or new organization or alliance in order to be resolved; or
- New or different managerial, financial, or operational arrangements.

#### **Requires Legal Action**

This category is defined as a regulation or policy that:

- Would require new or different contract conditions or agreements; or
- Could result in a lawsuit; or
- Would require the City to obtain new legal or regulatory authority.

# **Summary of Priority Issues**

As a result of the review of the above criteria and the interviews, the original list of priority regulations and key policy issues was modified and updated. Again, although there are many key regulations, a subset of these key regulations and issues was felt to warrant special



attention in the near-term. In developing the associated environmental goals for the wastewater and runoff programs, the technical teams will use these priority issues.

The full list of priority regulations and key policy issues is presented in Table 1. Each of these is then discussed in greater detail. The full set of updated priority regulations and key policy issues is presented in Attachment B.



Table 1 Priority Regulations and Key Policy Issues					
Priority Issues	Program	Revised Phase of Program	Timing of Issue		
Beneficial use designations for all water bodies and narrative standards in the Basin Plan	Wastewater	Current	As National Pollutant Discharge Elimination System (NPDES) Permits are Renewed		
Clean Water Act 303(d) listings for all water bodies (including urban lakes)	Wastewater, Runoff	Current/ Proposed	Every 4 Years		
Total Maximum Daily Load (TMDL) Development - Draft Strategy for Developing TMDLs and Attaining Water Quality Standards in the Los Angeles Region	Wastewater, Runoff	Current and Proposed	Per Consent Decree – with a proposal to bundle different pollutant TMDLs for the same watershed		
Clean Water Enforcement and Pollution Prevention Act of 1999, as amended in 2000 by SB2165	Wastewater	Current	Current and ongoing for all effluent limits in NPDES permits unless Time Schedule Order (TSO) in place		
California Toxics Rule and the State Implementation Plan for the Inland Surfaces Waters and the Enclosed Bays and Estuaries of California	Wastewater	Emerging	As NPDES Permits are Renewed		
Local County Ordinances on land application of Biosolids – Must be Class A/May have even stricter restrictions on quality and application—Exceptional Quality	Biosolids	Emerging/ Crystal Ball	1-10 years		
Prohibition of bypass of the headworks for sanitary sewage and promulgation of Sanitary Sewer Overflow regulation for management of sanitary collection systems	Collection System Management	Current and Proposed	New Regulation ~18 months		
Sanitary System Management Plans in NPDES Permits	Collection System Management	Emerging	As NPDES Permits are Renewed		
Enforcement of Pretreatment requirements and standards on satellite systems	Wastewater	Proposed	As NPDES Permits are Renewed		
Groundwater Recharge, action levels, requirements and public health goals for nitrogen and TOC; new pollutants, endocrine disrupters and pharmaceutically active chemicals	DWP, Wastewater and Runoff Management	Proposed/ Crystal Ball	With Adoption of SSO Rule early in 2005		
VOCs & Ammonia from Biosolids Composting Facilities (Rule 1133) consistent with AB 1450	Wastewater	Current	1-5 years		
Odor as a result of VOCs & H2S from treatment plants and collection systems  General Order # 034 from AQMD and potential for requirements from LARWQCB in NPDES permits	Wastewater and Collection System Management	Current/ Crystal Ball	2-20 years		
Numerical Water Quality Standards for stormwater; as a result of TMDL development or across the board in the NPDES permit for all priority and toxic pollutants	Runoff and Watershed Management	Emerging per TMDLs; Crystal Ball for all stormwater permits	2 years for emerging 10-20 years for crystal ball		



#### **Beneficial Use Designations of Waters**

The use designations for the Los Angeles River, Los Angeles Harbor, and Pacific Ocean beaches directly affect both current and future discharges from the treatment plants and the acceptable flow and quality of the runoff. Currently, the beneficial use designations for the Los Angeles River depend on the location and the access to the River. Uses include:

- REC-1 Water contact recreation involving body contact with the water, as a potential and intermittent use depending on the location and access to the river;
- REC-2 Non water contact recreation, in some area it is intermittent;
- WARM, COLD, supports warm and cold water ecosystems such as fish, invertebrates and vegetation, existing, potential and intermittent depending on location;
- WILD support terrestrial ecosystems and habitats for such as mammals, birds, reptiles and amphibians and invertebrates, existing, potential and intermittent depending on location;
- GRW uses of water for natural or artificial recharge, existing, potential and intermittent depending on location;
- RARE uses of water that support habitats necessary for rare, threatened or endangered plants or animals, existing in a few locations;
- SPW uses of water that support high quality aquatic habitat for reproduction and early development of fish, existing in few locations in upper reaches of watershed in creeks;
- WET support wetland ecosystems, including providing flood and erosion control and stream bank stabilization and purification of naturally occurring contaminants, existing in a few locations;
- MUN uses for water supply, not limited to drinking water, potential on most reaches of the water and existing in a few.

The beneficial use designations for the Los Angles Harbor are:

- IND industrial activities that do not depend primarily on water quality, existing use for Marines and Inner Areas of the Harbor;
- NAV for shipping by private, military or commercial vessels, existing for all area of the Harbor;
- REC 1; REC 2, as stated above existing for all areas of the Harbor;



- COMM commercial and sport fishing including those intended for human consumption or bait, existing for all areas of the Harbor;
- MAR support marine ecosystems including vegetation, kelp, fish and shellfish or wildlife, existing for all areas of the Harbor;
- RARE existing for all area of the Harbor;
- SPWN potential for public beach areas of the Harbor;
- SHELL potential for all areas of the Harbor except public beaches where it is listed as existing.

The beneficial use designations for the Pacific Ocean beaches are primarily REC 1 and REC 2. In addition, NAV, COMM, MAR, WILD and RARE and SHELL are existing uses in most of the beach locations in Los Angeles County.

These designations have profound impacts; they not only directly define the effluent limits, but they will also determine the impairments of the water bodies and, thereby, the Total Maximum Daily Load (TMDL) analyses. This issue also affects future enforcement and the potential future treatment needs and consequently, resource requirements.

#### Clean Water Act 303(d) Listings for All Water Bodies (Including Urban Lakes)

Section 303(d) of the Clean Water Act requires the States to list water bodies that do not meet the beneficial uses, and where the application of the technology requirement will not remove the impairment. The beneficial use designations are the starting point. Most beneficial uses were designated in the 1970s or earlier. If the use existed in November 1975, it cannot be changed without a full analysis of the attainability of that use. The 303(d) listings of impaired waters for the Los Angeles River, Los Angeles Harbor and Santa Monica Bay; and soon, the urban lakes indicates where the uses are not met, based on water quality violations or other determinations. The 303(d) list also determines the potential source of the impairment and the high, medium or low priority of the impairment. The listings lead to the development and adoption of TMDL allocations, then to subsequent basin plan amendments and finally to new discharge permit requirements. This entire process is the major driver in the water quality program across the country. In Los Angeles it may result in far-reaching technology and management solutions to address the eventual permit standards to remove impairments and attain and maintain beneficial uses.

It is important to remember that the 1998 303(d) list is not the only concern in the TMDL program. It is true that many of the listings from 1998 are included in a Consent Decree, which contains a schedule for completion of the TMDLs (see below). However, 303(d) listings in 2003 and beyond (likely every 4 years) will carry schedules for completion of the TMDLs. Although EPA has yet to approve the final State 2003 list, it does contain some de-listings for



Ballona Creek, Marina Del Rey, Los Angeles Harbor, Los Angeles River in Sepulveda Basin, and Los Angeles River Estuary; new listings for Los Angeles City Lakes such as Lake Lindero, Ballona Wetland Watershed, reaches of the Los Angeles River, and Marina Del Rey. A new category on the list is called "watch." This means that there is evidence that there are impairments, but it is not conclusive. Ballona Wetlands Watershed, Los Angeles Harbor, Los Angeles River Estuary, and Dominguez Channel are included on the "watch" list.

#### **TMDL Development**

In December 2002, the RWQCB, the SWRCB and EPA Region 9 jointly proposed a Strategy for Developing TMDLs and Attaining Water Quality Standards in the Los Angeles Region. The purpose of this strategy is to clarify when and how TMDLs will be developed over the next 10 years and how they will be coordinated with review of water quality standards and permit renewals. The strategy bundles the pollutant-specific TMDLs that are required in the Consent Decree by watershed so that there is a more efficient watershed/ecosystem approach to the TMDLs. The strategy opens the door to water quality standards revisions, which could be the result of use attainability type of studies or subclassification or refinement of uses.

The strategy also states that TMDL decisions will include guidelines describing how to implement the TMDLs through NPDES permits. Specifically, the strategy states that numerical waste load allocations that lead to numerical effluent limits will be expected for traditional point sources such as wastewater treatment plants. For wastewater NPDES permits, it is anticipated that TMDLs will have specific waste load allocations for individual treatment facilities. In the case of stormwater NPDES permits, the waste load allocation will likely be grouped under one or more general waste load allocations. This has already been demonstrated in the Santa Monica Bay TMDL for Bacteria. It has been assumed that all TMDLs must be adopted in Basin Plans prior to being implemented in NPDES permits. The strategy proposes that if a TMDL can be achieved in a single permitting action, a Basin Plan amendment may not be required.

The strategy also establishes a process by which stakeholder groups can lead the development of these watershed TMDLs and identifies opportunities for varying levels of stakeholder involvement in the TMDL process.

The strategy is clearly considered "proposed" at this time. The intention is that when the strategy becomes final it will be included in the SWRCB's Continuing Planning Process, which EPA is asking all states to reinvigorate and use as part of the TMDL listing process.



#### California Toxics Rule

The 1987 amendments, section 303(c)(2)(b), to the Clean Water Act required that toxic pollutants be regulated to protect the water quality and beneficial uses of the nation's waters. Across most of the country, the National Toxics Rule is in effect. However, in California, as a result of lawsuits and other issues between the State and the EPA, the California Toxics Rule (CTR) was promulgated in May 2000. The Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays and Estuaries of California (the State Implementation Plan or the SIP) was adopted with the CTR. The CTR and the SIP, which includes the implementation approach to applying toxic pollutant objectives for discharge permits, are expected to result in new and considerably more stringent effluent discharges standards for all NPDES permits. In general, these new standards will be extremely difficult to meet on a consistent basis without new and more extensive treatment or source control programs; such commitments would go well beyond any requirements that are implemented in the United States today. Where new water quality standards are not met, such as standards to protect human health through water quality limits for water bodies with beneficial uses for fishing and shellfish consumption, there is a potential for new 303(d) listings of impairments. As stated above, 303(d) listings lead to TMDLs which can lead to requirements for more treatment, or source control.

#### **Land Application of Biosolids**

In October 1999, the Board of Supervisors in Kern County passed an ordinance that banned land application of non – exceptional quality (EQ) biosolids by January 1, 2003. The Southern California Alliance of POTWs (Publicly Owned Treatment Works) (SCAP) and several major POTWs in Southern California tried to work with Kern County to assist with development of the ordinance that addresses the need for local control and oversight of biosolids land application in a logical manner. This effort has been largely unsuccessful. Controversial provisions include: expensive road impact fee, soil sampling every 40 acres, dioxin concentrations must be below 10 parts per billion (ppb), no Class B application after January 2003, 10 mile per hour (mph) wind limit for spreading, etc. EQ biosolids products are exempt from the provisions of the ordinance. The City of Los Angeles and other SCAP members have participated in lawsuits contending that the County is overreaching it jurisdiction, especially in regards to the California Environmental Quality Act (CEQA) by restricting interstate commerce by placing a road impact fee for biosolids trucks only and other issues. Superior Court in Tulare County ruled in favor of Kern County on every count. The County has developed a new ordinance that limits the amount of biosolids of any quality on land due to potential impacts on the groundwater resources. This too is being contested by the City.

In the meantime, in King County, an ordinance that bans Class B biosolids in February 2003 was adopted pending completion of CEQA documentation. The ordinance allows for the use of EQ biosolids until February 2006, thereafter only EQ Biosolids in compost form will be allowed. A lawsuit was filed against the ordinance. The court ruled in favor of King County and the ordinance despite appeals by the Orange County Sanitation District (OCSD). The



OCSD request for extended time on their permit was denied. The court decision on the adequacy of the CEQA compliance document was appealed. Orange County filed an appeal on the Board of Supervisors decision to not extend their use of Class B biosolids land application. This appeal was denied.

In Riverside County an ordinance banning the land application of Class B bisolids was adopted in November 2001, and there are questions as to whether Class A will be acceptable without large buffer zones so as not to be objectionable to neighbors.

As a result of these developments in Kern, Kings and Riverside Counties, the land application of biosolids and the related regulatory issues are considered a priority key issue because the alternatives to the land application of biosolids are extremely expensive and limited in number. The City has already extensively invested in Class A technology and land application sites. However, continued restrictions would inevitably demand more treatment, research and development or more distant land application sites. The issues related to biosolids reuse and/or disposal will likely have profound impacts on the technology and management solutions as well as locations of disposal and reuse.

#### **Prohibition of Sanitary Sewer Overflows**

With over 6,500 miles of sanitary sewers in its system, and because of the prohibition against bypassing any treatment plants, the potential for a sewer spill or overflow (a permit violation) is significant; consequently, the bypass prohibition is a key priority issue. It should be noted that mandatory enforcement under Senate Bill 709 does not apply to these spills and overflows because they are not effluent limit violations and because they occur in the collection system rather than at the treatment plant. In addition to current prohibition of overflows, proposed regulations for sanitary sewer systems will have a profound impact on collection system management and capacity determinations. The City has already implemented the Capacity, Management, Operations and Maintenance (CMOMs) However, under a proposed Sanitary Sewer Overflow (SSO) Rule, these requirements would now be in the NPDES permit and under regulatory scrutiny, especially The City may need to review and revise the subcontract the capacity requirements. agreements with the 27 entities that are satellite systems to gain assurance that SSOs are not caused by the lack of CMOMs program in the satellite systems. The following two issues are also related to this priority key issue.

#### Sanitary System Management Plans

A requirement for Sanitary System Management Plans could be included in future NPDES permits in the absence of a final national SSO Rule. In Orange County, California, the permit has included essentially a CMOM program called the Sanitary System Management Plan as a direct result and concern of the Beach Closures that have been occurring there. It is possible that the Los Angeles Regional Water Quality Control Board (LARWQCB) will add this plan to the City's Hyperion Treatment Plant NPDES permit as soon as it comes up for renewal. This



is considered a priority key issue because it is likely that such regulation will occur even without a national SSO Rule.

#### **Pretreatment Program Enforcement**

The state has begun to question why pretreatment programs implemented by the contract agencies (satellite system) are not enforced through the Bureau of Sanitation. Although this is beyond what is contemplated in the draft SSO Rule, this could lead to major new contractual requirements or resources and enforcement requirements for the Bureau of Sanitation.

Overall, regarding the above three issues, the prohibition of SSO and the implementation of new SSO requirements will lead to the need to consider even more storage and treatment for wet weather flows in the sanitary system, both of which will be important technology and cost issues for the Facilities Plan.

#### **Groundwater Recharge**

Groundwater recharge is a primary option for both supplementing water supply and for management of effluent and runoff. The political reluctance to support the East Valley Reclamation Project, and the draft groundwater recharge regulations from the Department of Health Services (DOHS) has caused this issue to become an extremely high priority. It appears that the DOHS and the LARWQCB are concerned about new toxic chemicals, total organic carbon (TOC) and nitrogen, endocrine disruptors, boron, N-nitrosodimethylamine (NDMA), and pharmaceutically active chemicals. The attempts to include public health goals and action levels in permits (which would require monitoring for these constituents) have the flavor of regulation and raise public doubt about the safety of groundwater recharge of recycled water. (This is currently the issue on the Dominguez Gap Salt Water Barrier permit for the Terminal Island Treatment Plant effluent).

One of the guiding principles for the IRP is to maximize the use of recycled water. Currently, it is becoming increasingly difficult and time-consuming to permit well injection or surface spreading of recycled water if there is indication that the groundwater is, or will become a potable water supply. This means that options for expanding and maximizing industrial and irrigation uses for recycled water will be necessary if the water recycling program is to grow to meet the guiding principle objectives.

It appears that continued percolation or even injection of stormwater runoff will not be a problem in the short run. Blending of recycled effluent with runoff for spreading or injection will be subject to scrutiny and may require a higher level of treatment [microfiltration, reverse osmosis (RO), and ultraviolet disinfection (UV)] in addition to extensive monitoring.

#### **Odor and Air Quality Concerns**

Odor concerns are traditionally related to wastewater collection and treatment facilities. But, the Air Quality Management District's (AQMD) new VOC and ammonia rule (Rule 1133) could affect other facilities, such as the composting facility at Griffith Park. The AQMD



adopted Rule 1133 on January 10, 2003. The rule regulates biosolids composting, requiring enclosure of the active composting and venting of emissions from both the active composting and the curing and storage operations to a control device such as a biofilter. The rule also requires an 80% reduction in VOC emissions.

Existing operations must phase in controls over the next few years. Existing facilities such as the one at Griffith Park must submit an emissions control plan that will demonstrate compliance with emission reductions as stipulated by the new rule. New facilities will be required to have these controls in place at the onset of operations beginning in 2007.

In response to the AQMD's recent rulemaking effort, SCAP undertook a study of VOC and odorous emissions from biosolids composting operations through each phase of the process. Emissions tests were carried out at specially-created aerated static piles at the Griffith Park facility. The study concluded that the emissions from composting operations depend greatly on the mixing of the pile and other operational parameters.

Regulation of VOCs and H<sub>2</sub>S concerns at treatment plants are part of current air quality regulatory schemes. Recently, the Region 2 RWQCB put specific odor control requirements in the San Francisco NPDES permit for the Southeast Water Pollution Control Plant. This brings the air quality regulation beyond a nuisance issue of odor, to a discharge permit issue. Further application of air quality or nuisance regulations to the collection system is possible, especially under a CMOM scenario. Control of collection system odor and air quality emissions may require significant technology and management options in order to address and control these odors.

Odor control impacts all aspects of the reputation and credibility of the collection, treatment and disposal systems and the owner organization. As the IRP is developed, the impacts of odor on the public and sensitive receptors must be considered in order to protect and enhance the long-term credibility and reputation of the City.

#### **Numerical Water Quality Standards for Stormwater Runoff Management**

Based on current interpretation of the stormwater section of the Clean Water Act and the implementing regulations, best management practices (BMPs) based on reducing the discharge pollutants to the maximum extent practicable (MEP) is how the water bodies of the nation are protected from pollution due to stormwater runoff during wet weather. However, under the scenario of an impaired water body on the 303(d) list, (or an impaired use of the water body) for which the main source is stormwater runoff, the result may be numerical water quality standards for a wet weather stormwater runoff management permit. In the case of the Santa Monica Bay Bacteria TMDL, there is a proposed numerical standard for the quality of the wet weather stormwater runoff. This scenario may not apply for every TMDL for which stormwater is a major source of the impairment, but it is a possible outcome.



There is a potential that the broad application of best management practices and MEP for the non-TMDL related (wet weather) stormwater runoff management will be removed as a result of a lawsuit. Each year, lawsuits are filed by environmental activists against the EPA and state permitting agencies throughout the nation. These are similar in that they contend that numerical water quality standards are required, under the Clean Water Act, for all NPDES discharges. Thus far, judges have not ruled that all stormwater permits must contain numerical water quality standards, but it is possible that such an interpretation could be made. Such a judgment would have profound and far-reaching consequences for the City of Los Angeles and for the technology and management choices under the IRP.

# Management Issues That Lead to Additional Regulatory Concerns

There are two major management issues, which are part of the IRP Guiding Principles, which will lead to future additional regulatory concerns. Although strictly speaking these are not regulations themselves, decisions in the facilities plan on how to accommodate these management issues could lead to future regulatory concerns.

#### **Brine Treatment and Disposal**

As mentioned in this memorandum and others on the subject of the Clean Water Act, the basis of the water quality program is the beneficial uses of designated water bodies. From that designation and the objectives for protecting the uses derives all the water quality standards, NPDES requirements and prohibitions and the listing of impaired waters. As a result of these regulations and requirements it is becoming more and more difficult to discharge to inland surface waters where dilution is not available. Consequently, both the wastewater and the stormwater programs plan to consider water recycling and stormwater recycling as alternatives to waste discharge in the future. As mentioned above however, the DOHS standards for groundwater recharge and recycled water use, may lead to management options that do two things: 1) require a higher level of treatment with an associated brine that contains not only salt but concentrated levels of toxic pollutants, and 2) recycled water facilities located upstream in the wastewater and stormwater collection system so that traditional methods of brine disposal in the ocean, bay or harbors is not as cost effective. Therefore, it can be anticipated, that there will be future regulatory concerns about brine, what it contains, where it can be discharged and if there are any environmental impacts or water quality impacts to alternative brine discharge. In the previous technical analyses of regulations, continued brine discharge into the Los Angeles Harbor is mentioned as potentially being disallowed in the future due to section 303(d) listings for the Harbor. The priority key issue for the future is whether brine can be treated or reused or recycled, and if not, what are the feasible disposal options for the brine.



#### Los Angeles River Redevelopment

A watershed approach, as a management option for the Los Angeles River is currently proposed to address environmental, water quality and quality of life and economic development issues for the City. A major emphasis of this management approach would likely be the restoration of the River ecosystem while simultaneously providing flood control and water quality improvements. These challenges will be especially difficult considering the TMDL numeric wasteload allocations and the Federal Emergency Management Agency (FEMA) requirements, both of which will likely be very precise. A watershed and ecosystem approach could lead to additional regulatory standards and requirements that would inevitably have financial ramifications and could require changes in the way that wastewater treatment plants operate or whether additional or alternative treatment is desired. example, wetlands may be constructed which would require a specific flow during dry weather, would require a specific water quality and which would prevent or restrict the amount of recycled water development. Additionally, new wetlands can lead to new designations of the river, with new beneficial uses (or better defined uses), which need to be protected via higher levels of water quality or quantity. Although these are only examples, and ones that are not fully understood, the point is that management options can lead to application of water quality regulations beyond what is now contemplated. In the course of developing options for the IRP specifically designed to address the current, emerging, proposed or crystal ball regulations it is possible that other regulations could be triggered. Future evaluation of the Los Angeles River redevelopment should consider these potential impacts.

# **Comparison Between Phase I and Phase II lists**

The list of priority key issues contained herein on Table 1 is essentially the same since Phase I. The Phase I Wastewater and the Phase I Stormwater Management list are now combined into this one list. A few new items have been added. The first of these is TMDL development, due to their impact on the wastewater and stormwater runoff programs. Secondly, Groundwater Recharge Standards was added because of the IRP guiding principle that calls for increased water recycling. The air quality requirement for VOCs and ammonia at composting facilities was also added. In addition, the SSO issue has been expanded to include enforcement of pretreatment rules and the new Sanitary Sewer Management Plan, all of which are priority key issues and are all related to collection system management and contractual arrangements with satellite systems.

# **Connections Between the Priority Key Issues**

The water quality program under the Clean Water Act is constructed to:

- Develop beneficial use designations;
- Develop water quality criteria for protection of beneficial uses;



- Apply these criteria to specific water bodies based on the specific beneficial uses that need to be protected; and
- Apply anti-degradation to ensure that high quality water bodies remain high quality.

The basis of the regulatory drivers is the designated beneficial uses of each particular water body. If those uses, or the standards adopted to protect those uses, are violated or impaired, the water body becomes listed on the 303(d) list as impaired. This listing then leads to a TMDL, which potentially leads to a higher level of protection through technology applications and management practices. Therefore, for both the wastewater and the stormwater runoff management programs, the connection between these priority key issues starts with the designated beneficial uses.

In the case of the wastewater program, the next steps will involve the water quality standards, which are primarily the CTR and SIP limits for the three non-ocean effluent discharges. Meeting these requirements and the environmental goals they represent will require major considerations of the technology and management options in the IRP. In some cases, such as the option for a higher level of treatment (that can be for both water recycling and effluent discharge or for alternative disposal to a wetland or redeveloped riparian habitat) such as membrane bioreactors or reverse osmosis the result is another set of concerns: brine and where it can be disposed without causing environmental or public health problems.

If water quality standards cannot be met, TMDLs may be the next step. We have already seen in the State adopted 2003 303(d) list, new listings based on the CTR standards. As with brine, other byproducts, such as odor and biosolids, must be considered in establishing environmental goals for the IRP.

For the stormwater runoff management program, the major consideration is the TMDLs, and the new requirements for technology and management solutions not required under the non-TMDL related stormwater runoff program. Many of the environmental goals and the subsequent technology and management options will be the same as found in the wastewater program and will include: more or better treatment; more or better disinfection; development of alternative treatment or disposal options; relocation of discharge or removal of discharge; or reduction of runoff at the source through a variety of management options.

In addition to and somewhat unrelated to the goals of treatment and management of effluent and stormwater or the by products of these processes, is the priority key issue of the SSO Rule, and the Sanitary System Management Plan. This proposed rule and new NPDES permit requirement leads to major capacity determinations (including size of pipes and interceptors) for the collection system and potential capacity enhancement in order to prevent overflows in the system. But this rule is not limited to the collection system because once the wet weather flow is contained in the system it also has to be treated. This means capacity determinations



for treatment of all the captured flow either at existing treatment plant or at new peak wet weather treatment facilities has to be part of the IRP analysis for meeting future regulations.

# **Conclusions/Next Steps**

The regulatory issue of concern for the wastewater program will continue to be driven by designated beneficial uses, the quality of the effluent from the treatment plants and the requirements of TMDLs as they are developed.

As discussed earlier, this Regulatory Forecast Technical Memorandum serves to summarize the anticipated regulatory requirements and the key issues the City could face in the future. The next step will be to conduct strategy sessions with technical staff from the runoff and wastewater disciplines to review these key issues and strategize appropriate environmental goals to meet them. These environmental goals, in conjunction with the wastewater flow projections and urban runoff loading projections will be the basis from which options are developed from the IRP.

The development of environmental goals should be based on:

- The anticipated California Toxic Rule (CTR)/State Implementation Plan (SIP) requirements for each treatment plant;
- The water recycling requirements, especially those for groundwater recharge as they are more stringent than those for industrial/irrigation use; and
- The scheduled TMDLs from the 1998 list and the proposed 2003 list focusing particularly on the pollutant and water body on the list correlated to the effluent discharge.

Through this process, air quality and biosolids quality and management, and collection system capacity will continue to be priority key issues, because they meet all the criteria for identification of priority key issues.

Stormwater runoff management is a much larger and less manageable program compared to the wastewater program. The intermittent nature of the wet weather runoff and sheer volume and magnitude of it requires larger facilities and more effective and dispersed management solutions. But as with the wastewater program, the key priority issues for the stormwater program start with the beneficial uses and lead to TMDLs which lead back to permits. The environmental goals in this case should be based on the TMDL schedule for the 1998 list and the proposed 2003 list.



#### Attachment A

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Attachment B – Regulatory Forecast Tables



	Table B1				
	Regulatory Forecast - Pretreatment				
Item	Regulations and Policies	Agency	Revised Phase		
1	40 CFR part 403	EPA	Current		
2	NPDES permits Permit No. CA0056227 (for Tillman Water Reclamation Plant) Permit No. CA0050000 (for LA-Glendale Water Reclamation Plant) Permit No. CA0053856 (for Terminal Island Treatment Plant)	LARWQCB	Current		
	Permit No. CA0109991 (for Hyperion Treatment Plant)				
3	Los Angeles Municipal Code, Ordinance No. 64.30	City	Current		
4	Rules 1171 and 1122, replacement of organic degreasing agents with water soluble degreasers	SCAQMD	Current		
5	Clean Water Act Enforcement and Pollution Prevention Act of 1999 (SB 709)	SWRCB, LARWQCB	Current		
6	Grease trap ordinance (possibly through Administrative Order) (FOG)	EPA, City	Current		
7	TMDL Wasteload Allocations and Implementation Plans	LARWQCB	Emerging		
8	40 CFR Part 131 (California Toxics Rule)	EPA	Emerging		
9	Policy for implementation of toxic standards for inland surface waters, enclosed bays, and estuaries of California (State Implementation Plan, adopted March 2, 2000)	SWRCB	Emerging		
10	40 CFR Part 444 (Commercial Hazardous Waste Combustors)	EPA	Proposed		
11	40 CFR Part 445 (Pretreatment standards associated with landfills)	EPA	Proposed		
12	40 CFR Part 405-71 (Reformatting effluent guidelines and standards)	EPA	Proposed		
13	40 CFR Part 442 (Transportation equipment cleaning)	EPA	Proposed		
14	40 CFR Part 437 (Centralized waste treatment industry)	EPA	Proposed		
15	40 CFR Part 403 (Streamlining general pretreatment regulations)	EPA	Proposed		
16	40 CFR Part 435 (Synthetic based drilling fluids in the oil gas extraction)	EPA	Proposed		
17	40 CFR Part 438 (metal products and machinery)	EPA	Proposed		



	Table B2					
	Regulatory Forecast - Wastewater Collection System Management					
ltem	Regulations and Policies	Agency	Revised Phase			
1	Clean Water Act National Pollutant Discharge Elimination System (NPDES)	EPA RWQCB/ SWRCB	Current			
2	Cease and Desist Order 98-073 (sewage overflows)	RWQCB	Current			
3	Porter-Cologne Water Quality Act California Water Code	RWQCB	Current			
4	Regulation of Odors from Collection System (nuisance)	SCAQMD	Current			
5	<ul> <li>Sanitary Sewage Overflows</li> <li>Administrative requirements</li> <li>Capacity Assurance, Management, Operations, and Maintenance requirements (CMOM)</li> <li>Prohibitions on sewage overflow discharges to waters of the U.S.</li> </ul>	EPA RWQCB	Proposed – National, Emerging – Local (due to OCSD beach closures) Current			
6	Grease trap ordinance (possibly through Administrative Order) (FOG)	EPA	Current			
7	Dry-Weather Urban Runoff Diversions to POTWs	RWQCB	Emerging/Proposed			
8	Inflow & Infiltration Control Measures (part of CMOM)	RWQCB EPA	Proposed			
9	Wet-Weather Urban Runoff Diversions / Bacteria TMDL Compliance	RWQCB	Proposed			
10	Regulation of VOC and H2S Emissions from the Collection System (hazardous air pollutants)	EPA SCAQMD	Crystal Ball			



	Table B3				
	Regulatory Forecast - Wastewater Treatment and Operations				
	Donald C. Tillman Water R	eclamation Plant			
Item	Regulations and Policies	Agency	Revised Phase		
1	NPDES permit (permit no. CA0056227) (New: March 2003)	LARWQCB	Current/Emerging		
2	General Industrial Stormwater Permits	SWRCB	Current		
3	Clean Water Enforcement and Pollution Prevention Act of 1999 (SB 709) (Revised)	EPA, SWRCB, LARWQCB	Current		
4	Writ of Mandate and Stay of Permit	LARWQCB	Current/Emerging		
5	Beneficial use designations for LA River (including narrative), leading to application of water quality standards (WQS) and listings of impairments.	LARWQCB	Current		
6	Total Maximum Daily Loads (TMDLs) (LA River)	EPA, SWRCB, LARWQCB	Emerging		
7	Water Quality Based Effluent Limitations	EPA, SWRCB, LARWQCB	Emerging		
8	40 CFR Part 131 [California Toxics Rule (CTR)] Policy for implementation of toxic standards for inland surface waters, enclosed bays, and estuaries of California [State Implementation Plan (SIP)]	EPA, SWRCB	Emerging		
9	Effluent-dependent waterbody provisions in SIP for development of permit levels for CTR discharge standards	SWRCB, LARWQCB	Proposed		
10	More stringent Title 22 Requirements for Groundwater Recharge Operations (e.g., virus monitoring; percentage of reclaimed water in aquifers)	DOHS	Current/Proposed		
11	Issues related to Los Angeles River (e.g., redevelopment of the river, groundwater recharge in unlined stretches of the river; options and technologies for effluent disposal	Environmental Advocate Organizations / City Council Ad Hoc Committee on River	Proposed		
12	Nutrient Criteria for effluent discharges	EPA	Proposed		
13	Pollutants that are not problems now, but will become in the future (e.g., NDMA)	EPA, SWRCB, LARWQCB	Crystal Ball		
14	New aquatic and human health criteria (beyond CTR)	EPA, SWRCB. LARWQCB	Crystal Ball		
15	Sediment criteria for metals	EPA, SWRCB, LARWQCB	Crystal Ball		
16	Wildlife criteria to protect threatened and endangered species	EPA, SWRCB, LARWQCB	Crystal Ball		
17	Controls or standards for endocrine disruptors and pharmaceutically active chemicals	EPA, SWRCB, LARWQCB	Crystal Ball		
18	Substantial flow contributions from local contract agencies leading to increased pretreatment standards and amendments to agreements with contract agencies	EPA, SWRCB, LARWQCB	Crystal Ball		



	Table B4				
	Regulatory Forecast - Wastewater Treatment and Operations				
	Los Angeles-Glendale Wa	ter Reclamation Plant	<b>T</b>		
ltem	Regulations and Policies	Agency	Revised Phase		
1	NPDES permit (permit numbers CA005000, and CA 00949333) (new: Nov/Dec 2002?)	LARWQCB	Current/Emerging		
2	General Industrial Stormwater Permits	SWRCB	Current		
3	Clean Water Enforcement and Pollution Prevention Act of 1999 (SB 709) (Revised)	EPA, SWRCB, LARWQCB	Current		
4	Writ of Mandate and Stay of Permit	LARWQCB	Current/Emerging		
5	Beneficial use designations for LA River (including narrative), leading to application of water quality standards (WQS) and listings of impairments.	LARWQCB	Current		
6	Total Maximum Daily Loads(TMDLs) (LA River)	EPA, SWRCB, LARWQCB	Emerging		
7	Water Quality Based Effluent Limitations	EPA, SWRCB, LARWQCB	Emerging		
8	40 CFR Part 131 [California Toxics Rule (CTR)] Policy for implementation of toxic standards for inland surface waters, enclosed bays, and estuaries of California [State Implementation Plan (SIP)]	EPA, SWRCB	Emerging		
9	Effluent-dependent waterbody provisions in SIP for development of permit levels for CTR discharge standards	SWRCB, LARWQCB	Proposed		
10	More stringent Title 22 Requirements for Groundwater Recharge Operations (e.g., virus, monitoring; percentage of reclaimed water in aquifers)	DOHS	Proposed		
11	Issues related to Los Angeles River (e.g., redevelopment of the river, groundwater recharge in unlined stretches of the river; options and technologies for effluent disposal	Environmental Advocate Organizations / City Council Ad Hoc Committee on River	Proposed		
12	Nutrient criteria for effluent discharges	EPA	Proposed		
13	Pollutants that are not problems now, but will become in the future (e.g., NDMA)	EPA, SWRCB, LARWQCB	Crystal Ball		
14	New aquatic and human health criteria (beyond CTR))	EPA, SWRCB, LARWQCB	Crystal Ball		
15	Sediment criteria for metals	EPA, SWRCB, LARWQCB	Crystal Ball		
16	Wildlife criteria to protect threatened and endangered species	EPA, SWRCB, LARWQCB	Crystal Ball		
17	Control or standards for endocrine disruptors and pharmaceutically active chemicals	EPA, SWRCB, LARWQCB	Crystal Ball		
18	Substantial flow contributions from local contract agencies leading to increased pretreatment standards and amendments to agreements with contract agencies	EPA, SWRCB, LARWQCB	Crystal Ball		



	Table B	5	_		
	Regulatory Forecast - Wastewater Treatment and Operations				
Hyperion Treatment Plant					
Item	Regulations and Policies	Agency	Revised Phase		
1	NPDES permit (permit no. CA CA0109991)	LARWQCB	Current/Emerging		
2	General Industrial Stormwater Permit				
3	Clean Water Enforcement and Pollution Prevention Act of 1999 (SB 709) (Revised)	EPA, SWRCB, LARWQCB	Current		
4	The State Ocean Plan	SWRCB	Current/Proposed		
5	40 CFR part 503, sludge regulations	EPA	Current		
6	Kern County Ordinances on land application of biosolids; class A, EQ and fee for road use	Kern County	Current and Emerging		
7	West Basin Water Recycling Project - Agreement	DWP, West Basin Municipal Water District	Current		
8	Nutrient criteria for salt water bodies	EPA	Proposed		
9	Effects of diversion of dry weather runoff flows to HTP	LARWQCB	Proposed		
10	Effects of diversion of wet weather runoff flows to HTP for treatment and impact of bypass regulations on this option	EPA, LARWQCB	Proposed		
11	Water Quality Limitation Associated with West Basin Project	DOHS, LARWQCB, West Basin	Crystal Ball		
12	New aquatic and human health criteria (beyond CTR)	EPA, SWRCB, LARWQCB	Crystal Ball		
13	Sediment criteria for metals	EPA, SWRCB, LARWQCB	Crystal Ball		
14	Wildlife criteria to protect threatened and endangered species	EPA, SWRCB, LARWQCB	Crystal Ball		
15	Controls or standards for endocrine disruptors and pharmaceutically active chemicals	EPA, SWRCB, LARWQCB	Crystal Ball		

| pharmaceutically active chemicals | Li 71, SWITCES, LI WAGES | Orystal Bull |
Note: For additional discussion, refer to "Pertinent Regulations and Key Policy Issues Technical Memorandum" (CDM and CH2M HILL, April 2000)



	Table B6					
	Regulatory Forecast - Wastewater Treatm	_				
Terminal Island Treatment Plant						
Item	Regulations and Policies	Agency	Revised Phase			
1	NPDES permit (permit no. CA0053856) (renewal pending)	LARWQCB	Current/Emerging			
2	General Industrial Stormwater Permit					
3	Clean Water Enforcement and Pollution Prevention Act of 1999 (SB 709) (Revised)	EPA, SWRCB, LARWQCB	Current			
4	Enclosed Bays and Estuaries Plan and application of CTR levels to NPDES permit	LARWQCB	Current/Emerging			
5	Harbor Water Recycling Project (lead to studies for implementation of advanced treatment processes)	DWP	Current			
6	40 CFR part 503, sludge regulations	EPA	Current			
7	Kern County Ordinances on land application of biosolids; class A, EQ and fee for road use	Kern County	Current/Emerging			
8	Chronic Toxicity Testing Requirements	LARWQCB	Current			
9	Bay Protection and Toxics Cleanup program	SWRCB	Emerging			
10	Groundwater Replenishment and Industrial Reuse-Permit	LARWQCB, DOHS,	Emerging/Current			
11	Increased control requirements of toxic pollutants in order to recycle effluent (e.g., Boron, NDMA, MTBE, perchlorates)	SWRCB /DOHS	Proposed			
12	Nutrient criteria for effluent discharges	EPA	Proposed			
13	Effect of possible changes in the local industrial activity - impacts on trace elements that could require higher level of treatment for groundwater recharge or effluent discharge	LARWQCB/DOHS	Crystal Ball			
14	New aquatic and human health criteria (beyond CTR)	EPA, SWRCB. LARWQCB	Crystal Ball			
15	Sediment criteria for metals	EPA, SWRCB, LARWQCB	Crystal Ball			
16	Wildlife criteria to protect threatened and endangered species	EPA, SWRCB, LARWQCB	Crystal Ball			
17	Control or standards for endocrine disruptors and pharmaceutically active chemicals	EPA, SWRCB, LARWQCB	Crystal Ball			
18	Removal of Discharge Brine (from proposed RO facilities) Waste from LA Harbor	LARWQCB	Crystal Ball			



	Table B7		
	Regulatory Forecast - Water	er Recycling	
Item	Regulations and Policies	Agency	Revised Phase
1	California Code of Regulations, Title 22, Division 4, Chapter 3 (wastewater reclamation criteria)	DOHS	Current
2	Water Quality Control Plan (Basin Plan)	LARWQCB	Current
3	Reclamation NPDES permits	LARWQCB (close coordination with DOHS)	Current
4	Use of reclaimed water in instances where the public may be exposed	Los Angeles County Health Department	Current
5	Vector control requirements	State and local	Current
6	Increased degree of removal of pathogens and toxic compounds (e.g., <i>Cryptosporidium</i> , <i>Giardia</i> )	DOHS	Emerging
7	Establishment of more consistent water reclamation criteria (e.g., site-specific basis)	DOHS	Emerging
8	TMDLs	LARWQCB	Emerging
9	Triennial Review Process	LARWQCB	Emerging
10	California Toxics Rule	EPA	Emerging
11	Enhanced Surface Water Treatment Rule	EPA	Proposed
12	Proposed Title 22 Revisions	DOHS	Proposed
13	Control of endocrine disrupters and disinfection by- products	DOHS	Proposed
14	Alternative disinfection methods (e.g., UV radiation)	DOHS	Proposed
15	Considerations and/or Proposals for Recognition of Effluent Dependent Water Bodies and Expanded Water Recycling efforts	LARWQCB	Proposed
16	Water Conservation and Reclaimed Water Marketing Rules	LARWQCB	Proposed
17	Advanced treatment processes (reverse osmosis or other membrane-based treatment requirements, ultraviolet disinfection, etc.)	DOHS, EPA, SWRCB, LARWQCB	Crystal Ball
18	Dilution allowances for discharges to the ocean and enclosed bays	LARWQCB	Crystal Ball
19	Incidental groundwater recharge in the LA Angeles River	LARWQCB	Crystal Ball
20	Direct potable reuse	DOHS	Crystal Ball
21	Brine lines for disposal of membrane-process wastes	LARWQCB	Crystal Ball
22	Revitalization/de-urbanization of the LA River (concrete removal, bike paths, public and commercial uses, etc.)	Los Angeles County; possibly US Army Corps of Engineers	Crystal Ball
23	Aquatic/wildlife maintenance flows for the LA River	DFG, USFWS	Crystal Ball
24	Viruses in reclaimed water (monitoring, DNA verification and identification, etc.)	DOHS	Crystal Ball
25	Arsenic limitations due to presence in water supplies	EPA, SWRCB	Crystal Ball
	·	i .	



	Table B8  Regulatory Forecast - Air Quality				
Item	Regulations and Policies	Agency	Revised Phase		
1	Clean Air Act (CAA) and the 1990 Clean Air Act Amendment (CAAA)  40 CFR 50 – 99  CAA Title III, Section 112 ( r ) – RMP  CAA Title III, Section 112 ( r ) – General Duty Clause	EPA CARB SCAQMD Administrative Agency OES	Current		
2	Addendum to the 1997 Air Quality Management Plan (AQMP) and the State Implementation Plan 1994 AQMP 1997 AQMP 1997 AQMP Addendum The SIP	EPA CARB SCAQMD	Current		
3	Title V Operating Permits 1990 Clean Air Act Amendments (CAA), Title V	EPA SCAQMD	Current		
4	Solvent Cleaning Operations and Solvent Degreasers Rule 1171 and 1122, respectively	SCAQMD	Current		
5	Odor and Dust from Treatment Plants General Order #034	SCAQMD Local Jurisdictions such as the Cities of El Segundo and Los Angeles	Current		
6	California Accidental Release Prevention (Cal ARP) Program	Administrative Agencies – Fire Departments & Local Health Departments OES	Current		
7	Portable Equipment Registration and Permits	CARB SCAQMD	Current		
8	Maximum Achievable Control Technology for Publicly Owned Treatment Works (POTWs MACTs) and the Integrated Urban Air Toxics Strategy (The Strategy) 64 CFR 57572 and the 1990 Clean Air Act Amendments (CAAA), Title III for the POTWs MACTs Clean Air Act (CAA), Section 112 (k) for The Strategy Section 129 – New Source Performance Standards (NSPS) for POTW Combustion Sources	EPA SCAQMD	Emerging/Curr ent		
9	Diesel Particulate Matter as a Toxic Air Contaminant, California Toxic Air Contaminant Act (AB 1807, Tanner Act) Air Toxic "Hot Spots" Information and Assessment Act (AB 2588)	CARB SCAQMD	Current		
10	Environmental Justice Initiatives (1997 AQCD)	SCAQMD	Current		
11	Architectural Coatings Rule 1113 1994 AQMP 1997 AQMP	SCAQMD	Emerging		
12	Environmental Health Protection for Children SB 25	CARB	Emerging		
13	Proposed Amendments to the New Source Review of Carcinogenic Air Contaminants (Rule 1401) & Control of Toxic Air Contaminants from Existing Sources (Rule 1402) Rule 1401	SCAQMD	Current		



	Table B8		
Regulatory Forecast - Air Quality			
Item	Regulations and Policies	Agency	Revised Phase
	Rule 1402		
	Multiple Air Toxics Exposure Study (MATES – II)		
14	New Source Review/Best Available Control Technology (BACT) 1990 Clean Air Act Amendment (CAAA) and SCAQMD Regulation XIII	EPA SCAQMD	Current
15	Replacement of Fleet Vehicles for Government and Airport Operations – Rule 1190 Health and Safety Code, Section 40447.5 and SCAQMD Proposed	SCAQMD	Current
	Rule 1190		
16	VOCs & Ammonia from Biosolids Composting Facilities (Rule 1133) AB 1450	SCAQMD	Current
17	Environmental Justice Act SB 115	State Office of Planning and Research Cal EPA	Current
18	Hazardous Air Pollutants (HAPs) Emission from wastewater collection system	EPA	Crystal Ball
19	Laws, Regulations, and Rules that result in Cross-Media Pollution Transfers	SCAQMD	Crystal Ball
20	Future List of Carcinogenic Substances	CARB	Crystal Ball
21	Environmental Justice Issues (exposure/risk issues)	SCAQMD	Emerging



	Table B9		
Regulatory Forecast - Biosolids Management			
Item	Regulations and Policies	Agency	Revised Phase
1	40 CFR 503 (Regulations governing handling/treatment of biosolids	EPA	Current
2	Resource, Conservation, and Recovery Act (Waste Discharge Guidelines and Landfill Construction Regulations)	EPA RWQCB CISWMB	Current
3	Conditional Use Permits	Local Jurisdictions	Current
4	California Integrated Solid Waste Management Act, Assembly Bill 939 (AB 939)	California Integrated Waste Management Board	Current
5	Persistent Bioaccumulation Toxic Chemicals (reporting thresholds of PBTs)	EPA	Emerging
6	Kern County Biosolids Ordinance (imposes fees and bans land application of non-exceptional quality biosolids)	Kern County	Current
7	Biosolids Environmental Management System (to ensure biosolids are properly managed)	EPA, City of Los Angeles	Current
8	USDA Proposed Organics Rule (prevents biosolids from being used in organic crops)	USDA	Current
9	SB 205: Amendments to the Porter- Cologne Water Quality Act (development of waste discharge requirements for biosolids) (SWRCB General Order)	SWRCB/RWQCB	Current
10	Local Ordinances Banning Land Application of Biosolids	Local Jurisdictions (Cities & Counties)	Current Emerging/Proposed
11	Dioxin Reassessment (proposed amendments to 40CFR Part 503 regarding Dioxin in biosolids)	EPA	Emerging/Proposed
12	Radioactivity (NRC and EPA are evaluating whether radioactivity needs to be regulated in B.S.)	NRC, EPA City of Los Angeles	Proposed
13	Round 2 of 40 CFR Part 503 for Dioxin	EPA	Proposed
14	Beyond Class A cake	Local Jurisdictions	Crystal Ball
15	Fertilizer Regulations (labeling of biosolids)	California Department of Food and Agriculture	Crystal Ball

Note: For additional discussion, refer to "Pertinent Regulations and Key Policy Issues Technical Memorandum" (CDM and CH2M HILL, April 2000)



Table B10					
	Regulatory Forecast - Stormwater/Runoff Management				
Item	Regulations and Policies	Agency	Revised Phase		
1	Clean Water Act, Section 402(p) and Phase I regulations for MS4	EPA, LARWQCB	Current		
2	National Pollutant Discharge Elimination System – Municipal Storm Water and Urban Runoff Discharges within the County of Los Angeles (Permit No. CAS614001)	LARWQCB	Current		
3	Beneficial Use Designations per Clean Water Act (CWA) and State Resolutions (except for MUN)	LARWQCB and SWRCB	Current		
4	New development specific design criteria for mitigating storm water impacts for the California Coastal Zone	California Coastal Commission	Current		
5	Standard Urban Stormwater Mitigation Plan	County of Los Angeles Department of Public Works	Current		
6	Policy Statement on the Environment City of Los Angeles Adopted 1/26/99 Current		Current		
7	Storm water Ordinance No. 172172, Effective 10-01-98	City of Los Angeles Department of Public Works Bureau of Sanitation	Current		
8	Section 303(d) of the Clean Water Act – Impaired Water Bodies   EPA, SWRCB and   Propose		Emerging and Proposed (new list Jan 2003 )		
9	Total Maximum Daily Loads (TMDLs) including Consent Decree LARWQCB, SWRCB and Schedule for Completion of TMDLs in Los Angeles Region EPA		Emerging		
10	Region 9 Draft Guidance for Issuing Permits for Discharges into Impaired Waters in the Absence of a TMDL  Current		Current		
11	Trach and Bacteria TMDL for the Los Angeles Piver, Ballona		Current/Emerging		
12	Water Quality Enforcement Policy – LA Region	LARWQCB, SWRCB	Emerging		
13	Treatment of Dry Weather Urban Runoff (per TMDLs to reduce load allocations to water body)  LARWQCB  Crystal Ball		Crystal Ball		
14	Treatment of Wet Weather Urban Runoff (per Santa Monica Bay wet weather Bacteria TMDL)	LARWQCB	Proposed		
15	Application of Numerical WQS in stormwater permits as a result of the TMDL	LARWQCB	Emerging		
16	Application of Numerical WQS in stormwater NPDES permits for all priority pollutants and CTR pollutants	EPA, SWRCB and LARWQCB	Crystal Ball		
17	Redirection, Reuse, or Treatment of Stormwater - see water recycling issues	LARWQCB/DOHS	Current/ Emerging and Proposed and Crystal Ball		

Note: For additional discussion, refer to the "Stormwater Quality Management Technical Memorandum" (CDM and CH2M HILL, April 2001)



Table B11		
Construction Permits		
Regulations and Policies	Agency	Phase
Permits under Section 404 of the Clean Water Act Permit under Section 10 of the Rivers and Harbors Act	U.S. Army Corps of Engineers EPA	Current
Consultation under the Endangered Species Act	U.S. Department of Interior (U.S. Fish and Wildlife Service) EPA	Current
General NPDES Permits Individual NPDES Permits	Regional Water Quality Control Board	Current
Review under Sections 1600-1607 of the California Fish and Game Code (streambed alteration)  Review under Section 2080 <i>et.seq. of the Cal Fish and Game Code</i> relative to state listed endangered species	Department of Fish and Game	Current
Review and approval of historic property surveys	State Historic Preservation Office	Current
Coastal Development Permits	California Coastal Commission City of Los Angeles (for dual jurisdiction permits)	Current
Permits to construct pollution control devices and/or new emission sources	South Coast Air Quality Management District	Current
Encroachment Permits	California Department of Transportation	Current
Various land use, right-of-way, and construction permits	County of Los Angeles	Current
Review, coordination, and approvals from various City departments.	City of Los Angeles	Current
Conditional Use Permits; Approval of haul routes	Other Cities	Current
Scrutinizing of construction activities to a greater degree	State and Local Agencies	Emerging
Asbestos & Serpentine (airborne)		Emerging

Note: For additional discussion, refer to "Pertinent Regulations and Key Policy Issues Technical Memorandum" (CDM and CH2M HILL, April 2000)



Table B12		
Constructed Wetlands		
Regulations and Policies	Agency	Phase
Permits under Section 404 of the Clean Water Act Permit under Section 10 of the Rivers and Harbors Act	U.S. Army Corps of Engineers EPA	Current
	U.S. Department of Interior	
Consultation under the Endangered Species Act	(U.S. Fish and Wildlife Service) EPA	Current
General NPDES Permits Individual NPDES Permits	Regional Water Quality Control Board	Current
Review under Sections 1600-1607 of the California Fish and Game Code (streambed alteration)  Review under Section 2080 <i>et.seq. of the Cal Fish and Game Code</i> relative to state listed endangered species	Department of Fish and Game	Current
Beneficial use designations for wetland in Basin Plan (including narrative), leading to application of water quality standards (WQS) and listings of impairments.	LARWQCB	Current
40 CFR Part 131 [California Toxics Rule (CTR)]		
Policy for implementation of toxic standards for inland surface waters, enclosed bays, and estuaries of California [State Implementation Plan (SIP)]	LARWQCB	Emerging
Effluent-dependent waterbody provisions in SIP for development of permit levels for CTR discharge standards	SWRCB/LAWRQCB	Proposed

Appendix B Summary of the Steering Group Process and Their Recommendations for Integrated Resources Planning Development City of Los Angeles Integrated Plan for the Wastewater Program



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433 SOUTH SPRING ST. 4TH FLOOR LOS ANGELES, CA 90013-1957

On behalf of the City of Los Angeles Bureau of Sanitation, I would like to express our deepest gratitude to the Steering Group members for your phenomenal insight, vision and commitment during this first phase of our Integrated Resources Planning effort.

When we began this journey over 2 years ago, we started with a goal of providing an interactive stakeholder process and technical framework to assist our City's decision makers in developing supportable policies for the wastewater services that would integrate all of our City's water quality and water supply activities and elements. We began with a goal of building improved community involvement, understanding and support, through early and continued dialogue in this policy development process.

I think we have made dramatic progress toward meeting our goals. Together, we have shaped a strong and vibrant vision for the future of Los Angeles. I believe we have forged mutual respect and trust in our time together. We have built a framework for a sustainable future for the Los Angeles Basin, one where we can be sure that we have sufficient wastewater services, adequate water supply, and proper and proactive protection and restoration of our environment.

We have developed a progressive plan that, when implemented, will provide for reliable services while maximizing the use of our existing infrastructure, minimizing the need for extensive new construction, and aggressively conserving, protecting and beneficially reusing our limited natural resources.

I am proud of what we have accomplished together so far, and am truly excited about continuing our partnership through the ongoing planning and implementation of this shared dream for a healthy and safe tomorrow.

Thank you for your incredible efforts and contributions toward the Integrated Plan for the Wastewater Program.

Sincerely,

Judith A. Wilson, Director

Leavi Wilson

Bureau of Sanitation

#### INTRODUCTION AND OVERVIEW

The Integrated Plan for the Wastewater Program (IPWP) describes a future vision of wastewater and stormwater management in the City of Los Angeles (City) that explicitly recognizes the complex relationships that exist among all of the City's water resources activities and functions. Addressing and integrating the water, wastewater, and stormwater needs of the City in the Year 2020, the IPWP also takes an important step towards comprehensive basinwide water resources planning in the Los Angeles area.

We have participated in this process and assisted in the development of these policy recommendations because we want to be sure that Los Angeles has adequate water supply, wastewater treatment, flood control, and stormwater pollution prevention, while protecting and restoring our environment and improving our quality of life. With comprehensive planning and bold innovations, we can attempt to ensure that we meet the needs of Los Angeles.

This integrated process is a departure from the City's traditional single purpose planning efforts for separate agency functions, and will result in greater efficiency and additional opportunities for citywide benefits, including potential overall cost savings. This integrated process also highlights the benefits of establishing partners with other City-wide and regional agencies, City departments, and other associations, both public and private. The City selected a 20-year planning horizon for this program. Attached to this document is a glossary of terms used throughout this statement.

The goal of the IPWP effort is to define a general direction for planning by developing a set of policy recommendations to guide future investments. Therefore, the broad overview of technical issues was appropriate for relative comparisons. As a policy development guide, the IPWP acknowledges that actions taken to manage wastewater, biosolids and stormwater both affect and are affected by the water supply and water quality protection measures taken by the City and others.

Because the City not only treats wastewater generated within the City, but also manages and treats wastewater from 27 other nearby communities (i.e., "Contract

Agencies" such as the cities of Santa Monica and Beverly Hills), this regional approach is essential in system planning. In that context, the IPWP presents policy recommendations that attempt to be responsive to the overall, long-term water resources needs of the community and the environment.

Just as the IPWP recognizes the complex interrelationships in the urban water cycle, it also acknowledges that decisions regarding the City's environment and water resources should be fundamentally community-driven. For this reason, a stakeholder Steering Group was organized to capture and address the community's objectives and preferences regarding the future picture of water resources management in Los Angeles. The Steering Group is comprised of individuals representing a wide range of political, economic, geographic, environmental and social interests from throughout the City.

The Steering Group focused on defining its values with respect to public health, infrastructure, the environment, cost efficiency, quality of life, and education. It also studied the means of achieving those objectives: through building facilities; through managing resources; and through managing demands.

Through ten interactive workshops and a series of site visits and facilities tours, the Steering Group reviewed the wastewater, water and stormwater service needs of the City, as presented by City/Consultant staff, for the Year 2020. The Steering Group, as a whole, did not,



IPWP Steering Group members tour the Los Angeles Aqueduct Filtration Plant

#### Introduction and Overview

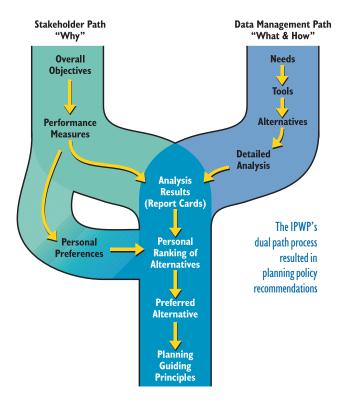
and was not asked to, render an opinion on the acceptability of growth in the region. Such considerations were outside the scope of the Steering Group's objectives. Nonetheless, this document provides policy recommendations about growth and its associated potential impacts that were assumed for the planning process. The Steering Group recommends that the City convene, through a separate forum, a working group to address broader growth issues.



IPWP Steering Group members visit West Basin Municipal Water District's water reclamation plant

The Steering Group also reviewed the interrelationships of wastewater, water, recycled water and stormwater service functions. The City/consultant staff presented to the Steering Group a number of integrated, alternative approaches for addressing future needs. The evaluation of alternatives relied upon value-based criteria that were developed by the Steering Group and considered the overall goals and objectives of the City. The Steering Group also developed performance measures, as well as their own individual satisfaction levels for each performance measure, which were then used to quantify how well a certain alternative performed in achieving the stated objectives.

City and Consultant staff interviewed each Steering Group member to determine how they, as individuals, would use the evaluation criteria in making personal decisions regarding alternatives. Based on the information considered in this exercise, the City and Consultant staff analyzed interview results, which indicated a preferred thematic alternative. In workshops, the Steering Group confirmed the



"preferred" alternative that best met the diverse interests and objectives of the group. And from this preferred thematic alternative, the Steering Group identified the basic policy features that they now recommend for consideration by the City Council in planning for the future of the City.

The report that follows summarizes the recommendations and views of the IPWP stakeholder Steering Group. It reflects many hours of time and effort on the part of City/Consultant staff and Steering Group members devoted to developing an understanding of the City's needs, the tools available to address those needs, and the trade-offs required to arrive at a consensus approach to action.



IPWP Steering Group members at Workshop 6

#### **BACKGROUND**

## The Integrated Plan for the Wastewater Program (IPWP)

Begun in October 1999 as the first phase of the City's overall Integrated Resources Planning process, the IPWP sought to accomplish two basic goals as part of developing wastewater planning policies:

- Enlist the public in the entire planning and design development process at a very early stage beginning with the determination of policies to guide planning; and
- Integrate water supply, water conservation, water recycling, and stormwater management issues with wastewater facilities planning through a regional watershed approach.

In implementing these goals, the IPWP combined traditional engineering-based planning concepts with consideration of less traditional technologies and non-structural options. These varied alternatives were evaluated in the context of the views of a broad cross-section of the community to establish planning policies that were both technically sound and publicly acceptable.

#### **The Public Participation Process**

As mentioned, a key component of the City's IPWP process was the involvement of the public at an early point in the facilities planning process. The City had never previously undertaken a comprehensive public outreach and involvement effort to this extent. Open dialog was important not only to gain public understanding of the wastewater program development

Steering Group City/Consultant Staff **City Policy Makers** Develop technically feasible Participate in ten Select final policy program (IPWP) half-day workshops alternativé Develop evaluation criteria Facilitate the IPWP process Provide individual evaluations The IPWP public Prepare summary statement participation process Recommend policy included several levels of involvement. Advisory Group Participate in five 2-hour meetings Provide input and suggestions to the Steering Group Information Group Receive periodic updates and share information with peers

process, but also to capture the collective ideas, experiences and opinions of the City's residents and customers.

To enlist public input, the City developed and implemented a comprehensive public outreach effort. Over a six-month period, over 1,100 organizations, agencies, associations, institutions and individuals were



IPWP facilitator Paul Brown and Bureau of Sanitation Director Judith Wilson participate in Workshop 6

contacted directly to determine their ability and willingness to participate in the planning development process. To provide flexibility, three different levels of participation were made available to all for self-selection:

Steering Group. The Steering Group committed to active participation through an extensive series of technical workshops. This level of participation represented the greatest commitment of time and energy. This group was responsible for guiding the process and ultimately developing the planning policy recommendations presented in this report. They were also responsible for keeping their respective organizations informed of project progress. A total of 54 people committed to this level of participation. Of this group, 31 members, representing organizations totaling more than 67,000 people, participated in a key interview process and formed the basis for policy recommendations.

#### **Background**

Advisory Group. Participants in the Advisory Group provided feedback and comments to the City and the Steering Group through a series of quarterly meetings. This level of participation required a commitment to attend the meetings and to provide feedback from the organizations that the Advisory Group represented. Like the Steering Group, the Advisory Group was also responsible for keeping their respective organizations informed of project progress. A total of 74 people, representing organizations serving a total of more than 68,000 people, joined at this level of participation.

**Information Group.** Members of the Information Group expressed an interest in being kept informed about the project, but its members were not required to commit to attend meetings or provide feedback to the process. A total of 61 people, representing organizations with a combined membership of over 16,500 people and 17 governmental agencies, joined at this level of participation.

In an effort to enlist as much involvement of the community as possible, the City also developed an additional outreach effort. Coordinated with the City Councilmembers' Neighborhood Councils, approximately 40 additional organizations were identified and contacted, and over a dozen of these organizations sponsored a special presentation at their regular meetings to learn more about the project and how they could contribute. As a result of this effort, over 60 additional participants were enlisted into the process.

In addition to the community-based outreach effort, a variety of City, County and regional officials participated in the process:

City, County and Regional Officials. City, County and regional officials were kept informed of the IPWP process through various means. The Board of Public Works, the City Council offices, and Mayor's office received Steering Group workshop minutes, Advisory Group meeting minutes, and periodic newsletters. They also received regular briefings on the project from the Director of the Bureau of Sanitation.

#### Technical and Management Advisory

Committees. Staff members from various City departments (e.g., Bureau of Sanitation, Planning, Department of Water and Power, Bureau of Engineering, Environmental Affairs, City

Administrative Officer, Chief Legislative Analyst) and other agencies (Los Angeles County Department of Public Works, California Department of Transportation (Caltrans), Army Corps of Engineers) guided the project through technical and management advisory committees.

#### **Technical Development**

As stated, from the outset, the City sought to consider the future needs for the wastewater system in the context of its relationships with both the potable water system and the stormwater system. The City/ Consultant technical team prepared an extensive technical study, which defined the Year 2020 needs for each of the key service functions:

- Potable water
- Wastewater collection, treatment and discharge
- Recycled water; and
- Stormwater (both dry weather and wet weather)

The technical team used population projections



The IPWP recognizes the relationships between multi-agency service functions

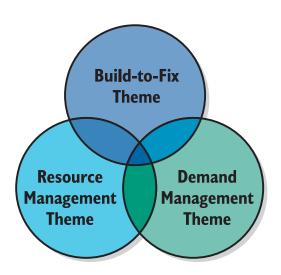
provided by the Southern California Association of Governments to estimate Year 2020 water and wastewater needs. The technical team identified the differences, or "gaps", between Year 2020 needs and current capabilities. These gaps included wastewater collection and treatment infrastructure, potable water supply sources, and wet and dry weather urban runoff quality gaps. To address these "gaps", the technical team constructed a series of technical alternatives.

#### **Background**

using combinations of both structural and non-structural options. As a starting point for discussion, the technical team created a set of "thematic" alternatives focusing on one of three broad approaches:

- Building more facilities (Build-to-Fix)
- Managing demand on the systems (Demand Management)
- Managing resources from the systems (Resource Management)

The Build-to-Fix theme focused on building new infrastructure to meet Year 2020 needs. The demand management theme focused on managing (reducing) demands to meet Year 2020 needs. The resource management theme focused on beneficial use or reuse of resources to meet Year 2020 needs. Although each theme was distinct, there was an overlap in the alternative components. For example, some methods of managing resources from the system inherently involved some construction (e.g., building more facilities).



The IPWP considered three broad approaches in developing thematic alternatives

In addition to the technical team's quality review process, some Steering Group members participated in a subcommittee to review the evaluation model for the project. While careful attention was paid to make sure that the technical information used in the IPWP was accurate and defensible, the goal of the IPWP was

the development of recommendations for planning policies. The evaluation of the thematic alternatives, therefore, focused on allowing the Steering Group to make relative comparisons between different planning approaches; it was not focused on developing conceptual designs, physical layouts or re-evaluating the needs assessment.

#### **Planning Policy Guidelines**

To evaluate alternatives, the Steering Group developed a series of performance-based criteria that reflected their objectives and values. These evaluation criteria defined the essential purposes of this planning process. The primary objectives developed by the Steering Group included:

- Protect the Health and Safety of the Public
- Provide Effective Management of the System Capacity
- Protect the Environment
- Enhance Cost Efficiency
- Protect Quality of Life
- Promote Education

The Steering Group also identified sub-objectives for each primary objective. In addition, the Steering Group developed quantifiable performance measures for each sub-objective, enabling a systematic comparison of alternatives. Taken together, the Steering Group's identification of objectives, sub-objectives, and performance measures constitute the evaluation criteria used in the IPWP.

Under all conditions and alternatives, it was assumed as a starting point, that the City would comply with all existing and future legal requirements.

A key feature of this process involved documenting the individual importance and satisfaction that Steering Group members attached to evaluation criteria. City and Consultant staff interviewed each Steering Group member to determine how they, as individuals, would use the evaluation criteria in making personal decisions regarding alternatives. This system was used to develop the preferred thematic alternative.

#### **Background**

Detailed documentation of the IPWP development, including background technical data, stakeholder evaluation process and descriptions of the overall preferred thematic alternative is provided in a separate document titled *Integrated Plan for the Wastewater Program*. This Summary Statement is included as a section of that document and is the only section formally developed and approved by the Steering Group.

The following table summarizes the assumed levels of performance of the Steering Group's preferred thematic alternative based on policy-level technical analyses for Year 2020:

Features of the Steering Group's Preferred Thematic Alternative			
Service Function	Level of Implementation (1)		
Wastewater Collection and Treatment	Focus on building new treatment facilities "upstream" in the system and size collection facilities to convey less flow "downstream" at the Hyperion Treatment Plant. Because there are adequate solids treatment processes downstream at the Hyperion Treatment Plant and Terminal Island Treatment Plant, it was assumed that these new upstream facilities would not include solids treatment processes.		
Recycled Water	Beneficially reuse approximately 80% of the "recyclable" water in the system, of which use approximately 48% for irrigation, approximately 17% for industry, approximately 27% for groundwater recharge, and approximately 8% for environmental enhancement.		
Inflow and Infiltration into the wastewater system	Reduce by approximately 50% through inflow reduction programs (approximate 13% reduction) and infiltration reduction programs (approximate 37% reduction), based infiltration and inflow generated from a 10-year, 24-hour duration storm.		
Water Conservation	Continue current planned conservation programs, and increase conservation efforts beyond what is currently planned. It was estimated that these combined efforts would reduce potable water demand in year 2020 by approximately 18% (compared to 1990 levels).		
Dry Weather Urban Runoff	Prevent approximately 38 million gallons per day from entering the receiving waters by diverting them to the wastewater system (22 million gallons per day) and to their own treatment facilities for reuse (16 million gallons per day).		
Wet Weather Urban Runoff	Capture and beneficially use approximately 50% of the annual average wet weather urban runoff through onsite percolation treatment controls (approximately 20%) and storage and reuse facilities (approximately 30%).		
Biosolids Management	Reuse 100% of biosolids generated at the wastewater treatment facilities.		

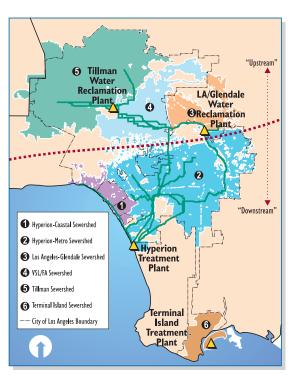
Note: (1) The assumed level of implementation for the Steering Group's preferred thematic alternative was based on broad technical analyses appropriate for policy-level planning. The actual levels of implementation will be further refined in the next, more detailed, phase of facilities planning.

## RECOMMENDED ELEMENTS OF PLANNING POLICY

At the completion of the evaluation process, the Steering Group identified the structural and non-structural elements of an approach that would do the best job in addressing the system needs for the Year 2020 while meeting the individual objectives of the Steering Group. The following discussion presents both the majority and minority viewpoints of the interviewed Steering Group members. The broad elements that are recommended by the majority of the Steering Group for consideration by City Council in water resources planning are as follows:

## Building new wastewater facilities "upstream" in the system

Under all conditions, there will be a need to construct and operate new or expanded wastewater facilities. Through the IPWP process, it has been shown that facilities placed upstream in the system offer greater opportunities for system operational flexibility, for beneficial reuse of treated effluent, and for reducing dependency on imported water for such uses as irrigation, industrial use, etc.



For wastewater system planning, the City of Los Angeles service area was split into "upstream" and "downstream" areas

For these reasons, all (31) of the interviewed Steering Group members prefer the building of new wastewater facilities in the upper part of the system. Because there are adequate solids treatment processes downstream at the Hyperion Treatment Plant and Terminal Island Treatment Plant, it was assumed that these new upstream treatment facilities would not include solids treatment processes.

## Producing and using as much recycled water as possible from the existing and planned facilities

Treated wastewater should be recognized as a valuable water resource, not a nuisance product to be disposed. Because of our location in Southern California, the need to maximize opportunities to responsibly use recycled water must be recognized. For this reason, all (31) of the interviewed Steering Group members support maximizing recycled water opportunities.



The IPWP Steering Group tours the Donald C. Tillman Water Reclamation Plant

Recycled water can be used for irrigation, industrial uses, environmental enhancement and groundwater recharge. All (31) of the interviewed Steering Group members would support the use of recycled water for irrigation and industrial uses.

The majority (19) of the interviewed Steering Group members would support the use of recycled water for any use. Five Steering Group members strongly preferred using recycled water for irrigation, industrial uses and groundwater recharge, rather than for environmental enhancement. Four Steering Group members strongly preferred using recycled water for irrigation, industrial uses and

#### Recommended Elements of Planning Policy

environmental enhancement, rather than for groundwater recharge. Two Steering Group members were concerned with using recycled water for groundwater recharge; one member did not want it due to technical/public health issues, and the second member did not want it unless the concept had been approved by the public through a voting/referendum procedure.

All Steering Group members support providing a public education program on the benefits and risks associated with using recycled water.

## Reducing the amount of rainfall-dependent inflow and infiltration as much as possible

During wet weather conditions, the wastewater system should be used to convey and treat wastewater, not wet weather urban runoff (i.e., stormwater) that makes its way into the system. Inflow and infiltration (I/I) of stormwater reduces conveyance capacity, increases the hydraulic demands at treatment plants, shortens the effective design lives of both types of facilities, and increases operation and maintenance costs.



Maintenance hole cover inserts prevent stormwater from making its way into the wastewater system

For these reasons, the majority (26) of the interviewed Steering Group members support reduction in inflow and infiltration. Five Steering Group members prefer demand management techniques other than I/I reduction, or they prefer only a minimal I/I reduction program. These Steering Group members cited objections to

potential work on private property, noting that a "collective" rather than decentralized approach was more favorable to them, and/or they expressed concerns regarding the reliability and cost-effectiveness of I/I reduction.

## Increasing the level of water conservation beyond what is currently planned

Water conservation programs have proven to be effective, especially whenever the public appreciates both the need to conserve and the resultant benefits that accrue. In Southern California, water conservation is an important aspect of daily life, and the sustainable use of available water resources is paramount to quality of life and environmental resources. The energy crisis has emphasized the importance of considering conservation as a means to meet needs.

Recognizing the reduction in the availability of imported water and the resultant wastewater flows generated, the majority (27) of the interviewed Steering Group members support increased levels of water conservation beyond the levels currently planned by the Department of Water and Power. These Steering Group members also support the concept of responsibility and accountability of each individual user to help eliminate water waste.

Three Steering Group members, while supporting increased conservation, preferred a moderate program involving the City's plan to increase market penetration of current conservation efforts. Four Steering Group members were either somewhat or fully satisfied with the current levels of conservation, and felt that additional conservation would be less desirable. These Steering Group members expressed concern that new programs could be unnecessary or could promote undesired growth.

# Increasing the amount of dry weather urban runoff that is diverted and treated or captured and beneficially used

The primary benefit of increased dry weather urban runoff diversion will accrue in reduced pollution throughout the City's waterways; this will have a major impact on the region's quality of life. In addition, dry weather urban runoff could potentially provide additional beneficial water reuse opportunities.

#### Recommended Elements of Planning Policy

To protect all beneficial uses, all (31) of the interviewed Steering Group members supported a moderate dry weather urban runoff program. Of these members, the majority (26) support an extensive dry weather urban runoff capture and beneficial reuse program. It was assumed that these diversions would not impair the beneficial uses of the receiving waters. Five members expressed concerns regarding the technical feasibility and cost-effectiveness of an extensive program.

One member considered diversions as a near-term solution and preferred a long-term goal of preventing pollution of dry weather urban runoff, thereby keeping waters needed for beneficial uses in the rivers and streams in the Los Angeles basin.

# Increasing the amount of wet weather urban runoff that can be captured and beneficially used

By capturing and beneficially using wet weather urban runoff, the City has the opportunity to further reduce its dependence on imported water. For this reason, all (31) of the interviewed Steering Group members support capturing and beneficially using wet weather urban runoff.



Steering Group member Andy Lipkis leads a tour of the Tree People BMP House in Los Angeles

#### Beneficially reusing biosolids

The requirements for biosolids beneficial reuse continue to become more stringent at the reuse locations and therefore require increased levels of treatment. The City's current beneficial use arrangements in Kern County will, at the very least, require the production of Class "A" biosolids in the

very near future. Opportunities at alternative reuse locations will likely be similarly restrictive. However, the Steering Group recognizes the benefits to the community of the beneficial reuse of this important resource.



City staff demonstrates the beneficial use of biosolids at the Green Acres Farm in Kern County

Therefore, almost all (29) of the interviewed Steering Group members support the beneficial reuse of biosolids. Where possible, biosolids should be beneficially reused locally (within Los Angeles County). For one Steering Group member, a moderate amount of biosolids reuse was preferable to reuse of all biosolids because of concerns regarding the safety of some reuse methods. One other Steering Group member would be equally satisfied with any level of biosolids reuse. Several Steering Group members supported biosolids handling "upstream" at point of generation (i.e., decentralized treatment), rather than downstream at one central treatment facility (e.g., Hyperion Treatment Plant).



Steering Group members and City staff admire the crops grown in soil fertilized with biosolids at the Green Acres Farm

## Focusing on lower-cost solutions, within the framework of the policy elements noted above

Providing for improvements in, and maintenance of, wastewater, recycled water, stormwater and water services that are adequate for meeting future needs may require increased investment in the programs which, in turn, could result in increased user costs. A wide range of possible costs for future actions is indicated by the alternatives studied in the IPWP process. In fact, individual economic preferences were considered in selecting the Steering Group's preferred thematic alternative. Many alternatives feature options that require significant investments, yet offer the added value of achieving level-of-service and environmental goals that are important for the City and may result in economic savings over time. Nonetheless, it is possible, within the scope of the desired options and policies outlined above, to strive for the lowest cost solutions that meet performance requirements.

For these reasons, the majority (25) of the interviewed Steering Group members support the use of lower cost solutions where they are available within the framework of the other policy elements.

Of this majority, some (15) members indicated a maximum cost (which varied) above which they would be completely unsatisfied. Six Steering Group members did not favor lower cost solutions. Of these six members, three of them expressed no preference with regard to costs, i.e., they indicated that they would be equally satisfied with any monthly household cost required by any alternative within the range of consideration. The three others felt that lower cost solutions might not offer the benefits and flexibility that moderate spending could provide, and they indicated a preference for costs within the middle of the expected range. Some members support a "growth-pays-for-growth" concept.

Within each of these elements, the Steering Group identified specific planning policy recommendations that should be used in moving forward with wastewater facilities planning. In addition, the Steering Group also developed programmatic planning policy recommendations that addressed a wide range of the "non-technical" elements. These programmatic policy recommendations were seen as overarching and enhancing the entire process.

## SPECIFIC PLANNING POLICY RECOMMENDATIONS

Based on the work accomplished in the IPWP, the Steering Group was able to recommend a series of policies that should be used by the City to guide facilities development in an integrated manner. These specific recommendations include action items, which, at a minimum, should be carried forward in the immediate future. Additional steps will also need to be developed in the future to ensure implementation by Year 2020. Also, these recommendations are not intended to preclude consideration of additional technical recommendations and action items that achieve the Steering Group's stated policy objectives.

#### **Wastewater Treatment Recommendations**

The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed building new treatment facilities upstream in the system. Because there are adequate solids treatment processes downstream at the Hyperion Treatment Plant and Terminal Island Treatment Plant, it was assumed that these new upstream facilities would not include solids treatment processes.

#### Specific Recommendations

Locate new wastewater treatment facilities in the upstream portions of the service area to maximize the potential for water reuse in the future.

Consider community impacts in evaluating potential sites for new facilities, including the proximity of new facilities to population.

Coordinate wastewater treatment facilities planning with other activities (inflow/infiltration reduction; water conservation; dry weather flow diversions) so that the need for expansion and/or new construction is minimized.

Continue to monitor technological developments and conduct appropriate pilot plant operations that could result in improved treatment quality as well as reduced operation and maintenance costs, including waterless treatment technology for onsite uses.

Ensure that all wastewater treatment operations comply, at a minimum, with all federal, state and local requirements.



Steering Group members visit the Donald C. Tillman Water Reclamation Plant in the San Fernando Valley

#### Action Items

Identify the sequence and timing for treatment facilities planning.

Regularly monitor population projections, water consumption rates and wastewater generation information to verify planning needs.

Establish a water quality forum to discuss environmental issues, upcoming regulations and public education programs.

Continue to implement the industrial source control program and regularly consider updates to address potential new industries not currently covered in the program.

Investigate, and implement as appropriate, options for denitrification (e.g., mechanical/biological unit processes, constructed wetlands, etc.).

#### **Wastewater Collection System Recommendations**

The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed building new treatment facilities upstream in the system and sizing the collection facilities to convey less flow downstream to the Hyperion Treatment Plant.

#### Specific Recommendations

Like wastewater treatment facilities planning, coordinate wastewater collection system facilities planning with other activities (inflow/infiltration reduction; water conservation; dry weather flow

#### Specific Planning Policy Recommendations

diversions) so that the need for new construction is minimized.

Reduce, if not eliminate, all avoidable wastewater overflows system-wide, especially those occurring during dry weather that reach receiving waters. Achieve reductions through proactive enforcement of ongoing programs as well as any enhancements that are necessary or appropriate.

#### Action Items

Identify the sequence and timing for collection facilities planning.

Increase flow-monitoring locations citywide to improve the calibration of the dynamic hydraulic model of the collection system.

Establish a water quality forum to discuss environmental issues, upcoming regulations and public education programs.

Encourage expedient and reasonable resolution of the outstanding concerns of the community, environmental groups and regulatory agencies.

#### **Water Recycling Recommendations**

The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed beneficially using approximately 80% of the "recyclable" water in the system. This assumed level of implementation was based upon broad technical analyses appropriate for policy-level planning. The actual level of implementation will be further refined in the next, more detailed, phase of facilities planning.

#### Specific Recommendations

Maximize water recycling whenever possible. Focus efforts on irrigation and industrial demands, while continuing to develop environmental enhancement and groundwater recharge uses.

Maximize recycled water usage using expanded upstream plant facilities.



Recycled water is used to irrigate crops

Develop water reuse projects with no significant public health risks.

Continue to monitor technological developments and conduct appropriate pilot plant operations that could result in improved treatment quality that meets public health requirements.

Ensure that all wastewater effluent discharges comply, at a minimum, with all federal, state and local requirements.

Continue to coordinate water-recycling planning on a regional basis.

Promote the growth of demand for, and opportunities for development of, greater water recycling within the Los Angeles basin.

Develop an education program on the benefits and risks associated with recycled water use.

#### **Action Items**

Conduct biological study to determine the minimum flow necessary to maintain riparian habitat and aquatic-dependent species in surface waters within the Los Angeles basin.

Protect all beneficial uses of surface waters within the Los Angeles basin.

Provide incentives to encourage recycled water use.

Conduct a cost/benefit analysis for producing and delivering additional recycled water to end-users.

Coordinate with the Department of Health Services to ensure that groundwater recharge meets any requirements necessary to protect public health.

Review the recycled water market, and develop/ implement proactive marketing efforts to maximize recycled water use, emphasizing irrigation and industrial purposes.

Seek outside funding (e.g. State, Federal, grants) to support recycled water delivery.

Conduct a cost/benefit analysis of the potential need to increase to higher level of treatment for groundwater recharge if recycled water becomes greater percentage of basin water consumption.

Seek potential partners to share both the costs and benefits of recycled water.

#### Specific Planning Policy Recommendations

Conduct feasibility study for locations of additional spreading of recycled water in the Los Angeles basin.

Establish a water quality forum to discuss environmental issues, upcoming regulations and public education programs.

#### Inflow/Infiltration Reduction Recommendations

The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed reducing inflow/infiltration into the wastewater system by approximately 50% through inflow reduction programs (approximate 13% reduction) and infiltration reduction programs (approximate 37% reduction), based upon infiltration and inflow generated from a 10-year, 24-hour duration storm. This assumed level of implementation was based upon broad technical analyses appropriate for policy-level planning. The actual level of implementation will be further refined in the next, more detailed, phase of facilities planning.

#### Specific Recommendations

Maximize the reduction of inflow into the wastewater collection system.

Maximize the reduction of infiltration into the wastewater collection system.



Maintenance hole inserts reduce inflow

#### Action Items

Develop agreements with contract agencies to promote correction of inflow problems in their jurisdictions, including corrections on private properties.

Develop an action plan to correct infiltration from private laterals with options for financial assistance for homeowners.

Develop an action plan for sealing the sewers and house connections, and making maintenance holes more watertight.

Develop an action plan for enforcement of existing laws for disconnecting illegal area drains and re-routing downspouts on industrial and residential properties. Establish goals for inflow source detection in main lines and lower laterals.

Invest in cost-effective infiltration detection methods.

Continue to monitor the system performance to identify any changes in the characteristics for the various sewer basins and incorporate the changes in the ongoing planning, reduction and upgrade efforts as necessary.

Develop an intensive inspection program to ensure results are achieved.

#### **Water Conservation Recommendations**

The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed that these combined conservation efforts would reduce potable water demand in 2020 by approximately 18% (compared to 1990 levels). This assumed level of implementation was based upon broad technical analyses appropriate for policy-level planning. The actual level of implementation will be further refined in the next, more detailed, phase of facilities planning.

#### Specific Recommendations

At a minimum, fully implement the currently planned conservation programs identified by the Department of Water and Power in the 2000 Urban Water Management Plan.

In addition, identify, evaluate, and implement, as appropriate, new opportunities for increased water conservation (beyond those measures already in place or planned).

Monitor technological developments throughout the world and conduct appropriate pilot testing to assess the likelihood of successful implementation in the Los Angeles basin.

Develop a comprehensive methodology for evaluating the "water conservation effectiveness" of new potential water conserving fixtures and appliances that consider both the associated water savings as well as their ability to successfully perform their designed function.

Coordinate the water conservation activities with all future wastewater facilities planning activities.

#### Action Items

Increase marketing and incentives to complete currently planned ultra-low flush toilet replacement and clothes washer replacement programs.

Invest in landscape water savings marketing and incentives.

Increase marketing and incentives to retrofit commercial, industrial and institutional toilets with ultra-low flush toilets.

Research and study applicability of retrofitting toilets with "Super" ultra-low flush toilets or waterless urinals.

Increase marketing and incentives for retrofitting car washes.

Research and study applicability of xeriscape-based landscape ordinances.

Determine the effects of increased conservation on raw wastewater concentrations and evaluate the impacts on wastewater treatment plant operation.

Bring all users to current conservation standards (e.g., through additional metering and potential subsidy).

Expand public education program.

Periodically review and update the conservation program, including funding/incentive programs.

Establish an enforcement mechanism for conservation ordinances.

Measure success of incentive-based conservation efforts and consider a tiered pricing structure, if needed.

Require all new construction to include individual metering.

Develop a plan for providing individual metering (both new and retrofit) to encourage individual user accountability and responsibility.

## **Dry Weather Urban Runoff Management Recommendations**

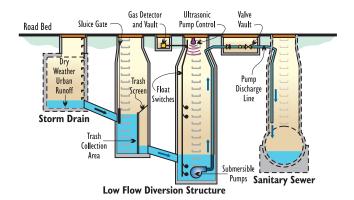
The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed preventing approximately 38 million gallons

per day of dry weather urban runoff from entering the receiving waters by diverting them to the wastewater system (approximately 22 million gallons per day) and to their own treatment facilities for reuse (approximately 16 million gallons per day). This assumed level of implementation was based upon broad technical analyses appropriate for policy-level planning. The actual level of implementation will be further refined in the next, more detailed, phase of facilities planning.

#### Specific Recommendations

Diversions to the wastewater system during dry weather

- Maximize the amount of dry weather urban runoff in the coastal areas that is intercepted (before it reaches the beaches and the Santa Monica and San Pedro Bays) and diverted to the coastal wastewater collection system for conveyance to the Hyperion Treatment Plant for treatment or diverted to an urban runoff treatment facility for treatment.



Low flow diversion structures capture dry weather urban runoff in the storm drains and pump it to the wastewater collection system

#### Treatment

- Maximize the amount of dry weather urban runoff that is treated in other areas of the City. Treatment could include urban runoff treatment facilities, constructed wetlands technologies to provide a natural pollutant removal process, or a combination of treatment technologies. Compliance with the Standard Urban Stormwater Management Plan will also result in treatment of some dry weather urban runoff.

#### Specific Planning Policy Recommendations

#### **Action Items**

#### Diversions:

- Resolve contractual differences in Contracting Cities Agreement to allow year-round diversions during dry weather. The current agreements prevent diversions during November through March. In the interim, plan/implement seasonal diversions.
- Address control issue of existing diversions to allow for year-round diversions during dry weather.
- Conduct evaluation of site-specific technical issues related to inflow, sewer capacity, monitoring and diversion controls and automation.
- Pilot test select sites for additional diversions for implementability and reliability.
- Identify sites for additional diversions, using criteria from evaluation and pilot tests.
- Develop agreements with affected agencies for sites identified for potential diversion.
- Conduct detailed sewer capacity evaluation to determine availability of excess sewer capacity to accommodate additional diversions.
- Conduct cost/benefit evaluation for additional diversions as compared to other treatment options.



Constructed wetlands provide a natural process to remove pollutants from urban runoff

#### Treatment:

- Monitor performance of the existing urban runoff

plant with regard to treatment performance, influent water quality variability, operational challenges and costs.

- Address site-specific technical challenges related to storm-drain low flow collection and delivery to an urban runoff plant.
- Conduct site-specific market identification study to determine availability of potential end users for treated dry weather urban runoff.
- Pilot test to identify and fine-tune preferred treatment technologies.
- Conduct a cost/benefit analysis to determine the relative trade-offs between capital and operation costs of an urban runoff plant versus additional diversions.
- Conduct pilot testing to demonstrate the ability of constructed wetlands to meet water quality goals.
- Identify available sites for constructed wetlands.

Continue development of public education programs and enforcement plans to change the waste disposal behavior for everyone who works or lives in the Los Angeles basin, thereby reducing and eliminating urban runoff pollution.

Develop and implement a stormwater management plan with regional and site-specific Best Management Practices to capture, treat or infiltrate wet and dry weather urban runoff to meet runoff capture goals.

### Wet Weather Urban Runoff Management Recommendations

The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed capturing and beneficially using approximately 50% of the annual average wet weather urban runoff through onsite percolation controls (approximately 20%) and storage and reuse facilities (approximately 30%). This assumed level of implementation was based upon broad technical analyses appropriate for policy-level planning. The actual level of implementation will be further refined in the next, more detailed, phase of facilities planning.

#### Specific Recommendations

Maximize the amount of wet weather urban runoff that can be captured and beneficially used through on-site treatment controls using percolation technology. At a minimum, the City should focus on applying this technology to new developments or to areas undergoing redevelopment, as required by the Regional Water Quality Control Board's Standard Urban Stormwater Mitigation Plan.



Onsite percolation controls capture stormwater from streets and percolate it into the ground

Maximize the amount of additional wet weather urban runoff that is captured and beneficially used through a centralized storage facility, decentralized storage facilities (onsite retrofits), or a combination of both.

Promote the concept of multi-purpose facilities in developing wet weather capture and use facilities.

#### **Action Items**

Develop and implement a stormwater management plan with regional and site-specific Best Management Practices to capture, treat or infiltrate wet and dry weather urban runoff to meet runoff capture goals.

Maintain, or if possible, improve groundwater quality. Conduct water quality evaluation of best management practice performance.

Conduct site identification study. Screen candidate sites considering soil type, site size, depth to groundwater, groundwater contamination issues, etc.

Conduct percolation studies and soil testing.

Conduct studies to determine pretreatment requirements.

Conduct studies for technical options to meet established water quality standards.

Seek outside sources of funding (e.g., State, Federal, grants).

Select design storm for stormwater capture for sites or projects that extend beyond the current legal requirements (i.e., Standard Urban Stormwater Mitigation Plan).

Research beneficial use options and conduct market survey of potential end users.

Conduct cost/benefit analysis, including infrastructure to deliver water to end-users.

Work with the Upper Los Angeles River Area water master to resolve issues of water "ownership" and permissibility of capturing and using rainwater for landscape irrigation purposes.

Establish agreements with individuals and the Upper Los Angeles River Area water master to permit private parties to capture and beneficially use stormwater in the Upper Los Angeles River Area.

Fully implement the requirements of the Standard Urban Stormwater Mitigation Plan.

Coordinate with the County and other agencies in development of programs.

Consider ordinances to standardize and schedule maintenance of facilities on private properties.

#### **Biosolids Management Recommendations**

The following recommendations are based on the Steering Group's preferred thematic alternative. The Steering Group's preferred thematic alternative assumed reusing 100% of the biosolids generated at the wastewater treatment facilities.

#### Specific Recommendations

Modify treatment processes so that only Class A (or better) quality biosolids are produced at all plants if used for land application.

Beneficially reuse 100% of biosolids produced.

Maximize reuse of biosolids within the City, Contract Agencies, and Los Angeles County whenever it is feasible, environmentally responsible, and in compliance with all regulations.

#### Specific Planning Policy Recommendations

#### **Action Items**

Investigate alternate technologies for producing higher-quality biosolids or new uses of biosolids.



City staff and Steering Group members tour the Green Acres Farm in Kern County

Provide additional research and education of alternative biosolids management technologies (e.g., composting toilets and neighborhood sewage systems). Research would include evaluating potential changes to the building code to facilitate implementation; developing incentives to encourage implementation; investigating appropriate education/outreach programs; and setting specific implementation targets and schedule.

Encourage the use of biosolids by City residents and investigate any existing City regulations that might restrict biosolids use.

#### **Programmatic Recommendations**

#### Public Health and Safety

All regulations pertaining to public health and safety must be met.

#### Protecting the Environment

All regulations pertaining to protection of the environment must be met.

#### **Enhance Cost Efficiency**

Proper cost accounting practices must be utilized in developing costs for projects and should take into consideration the potential economic benefits associated with a given environmental project (such as job creation, reduced imported water costs, etc.) as well as the additional benefits gained from multiuse projects.

Develop and maintain database of funding sources and partnering opportunities.

#### Promote Quality of Life

New facilities and programs should be planned and implemented in a way that ensures that no communities suffer disproportionately from adverse human health or environmental effects, and that all people live in clean, healthy, and sustainable communities.

New wastewater facilities should, whenever and wherever possible, be sited in a way that does not concentrate construction in areas that already have experienced recent disruptions.

New facilities should, whenever and wherever possible, enhance public lands.

#### **Promote Education**

The public must be involved in the ongoing development of wastewater facilities planning.



IPWP assistant manager Robert Manning explains the wastewater system to the Steering Group members

Design a comprehensive public education program to raise public understanding of wastewater issues, opportunities and implications to enable the public to effectively participate in the policy development conversations and to become partners with the City in implementing conservation strategies.

Develop a public education effort that begins with research to determine the levels of awareness and the best methods to use to achieve the desired level of awareness. At a minimum, the undertaking should cover water recycling benefits and risks, conservation, and urban runoff.

#### Specific Planning Policy Recommendations

#### Promote Development of New Technologies

Investigate new technologies showing promise to meet the City's objectives (e.g., cisterns, waterless toilets, etc.)

## Promote Cooperation with other Agencies and City Departments

Continue to look for integration opportunities, both within the City and externally with other agencies and groups, to develop partnerships and programs with mutually beneficial goals and objectives.

In summary, the Steering Group has generally recommended a policy of balanced and diversified investments in both the facilities and programs that offer reductions in the demands on infrastructure and efficient use of facilities and resources. Their views reflect a profound respect for the community, the environment, and the natural and fiscal resources that the City has

been entrusted with protecting. This Summary Statement is not intended to preclude consideration of additional technical recommendations and action items that achieve the Steering Group's stated policy objectives. The policy objectives in this Summary Statement are intended for broad planning purposes and community outreach efforts only and should not be used for other purposes without Steering Group notification and acceptance.

The Steering Group has demonstrated a desire to provide ongoing input in the future of potable water, wastewater, recycled water and stormwater in the City, as well as a commitment to public education on the importance of integrated resource management. Their collective efforts have produced a vision of the future that should improve the environment and help sustain a high quality of life for the diverse communities of Los Angeles.



## CONFIRMATION OF SUMMARY STATEMENT RECOMMENDATIONS

The Steering Group confirms that it has participated in the IPWP process and that the recommendations contained in this Summary Statement reflect the work that has been completed.

We have participated in this process and assisted in the development of these policy recommendations because we want to be sure that Los Angeles has adequate water supply, wastewater treatment, flood control, and stormwater pollution prevention, while protecting and restoring our environment and improving our quality of life. With comprehensive planning and bold innovations, we can attempt to ensure that we meet the needs of Los Angeles.

Steering Group Member	Date	Comments
Domingo F. Leon  PAIZUP C. HAGDE  FOR THE APARTMENT  OF GREATER LOS  Phillip C. Hagar		group to assess the fulrie of the wester waster plant of c. A
North Valley Coalities Cherie Mann		Yn sive Rope Jasto Sature Rushyn
Past Presiden West Chester	vitalizales	Now to implement

Steering Group Member	Date	Comments
Johnnie Raines	9/19	Hoppy to have been a past of the Prosegren
Deborah Beng Deborah Berg	9/19/0	opportunity to participate in this impressive effort
Lucia M. McGovern	9/0/01	It was great the provide right on something very vetal to the City's infastration
Scott Wilson	9/2/61	The vision
Charles A. Tolbert	1-9/21/01	Thanks for the Opportunity to be a part of making history I've learned a lot.
Mark Gold	9-24-01	Heal the Bay is eager to help the City emplement this progressive vision
Vista dei Mar Neighbo Playa dei Rey Julie Inouye	9/24/01 ors Assoc.	Thank you for bieng leaders in this "New Direction" for the City of Et. Now, lets make our ideas become reality!

Steering Group Member

Date

Comments

Polly Ward  Polly Ward  Andy Lipkis	9 24/01 ·	Jim impressed by flee Outroach into flee Greater community This is the exact integration of progrouns that tree People hos book oship for Oyears. We're here to woke
Charles Brink	9-24-01	a good first start
Trepuned Vays	<u> 09/25/</u> 0	productive team worked Exactly the way public husings
		Should be done
Charles Church	9/25/01	Thank you FOR TRYING TO PREPARE FOR THE FUTURE.
Charles Gremer		Keep up the good work . Gasi pe given me a lot of education I hope I helped you out

Steering Group Member	Date	Comments
Steve Fleischli	9/25/01	Let's selle that
Sheila H. Bernard	9/26/01	F don't want los Angeles to die of thirst. We need to handle water in a new way.
William T. Scenes, Jr.	-9/26/01,	Neavere very fertunalito have a group fadvisors to lead us thruthe laborath to better usefre succes.
John S. Lang	19/26/01	LET'S BHILD IT
Gary Futral	9/28/61	Rolying on our intrastructure
James R. Davis II		This is a Good Smat
Dorothy Green	10/3/01	The process has been estra- ordenary. Keep up the good work.

Steering Group Member

Date

Comments

Linda Scheid 19/9/20	001 Lets keep the
Linda Scheid	process going.
	Great Start.
10/9/6/ Elanara A Williams	I was froud to Janhayate on
Elenore A. Williams	this very emportant project
A /	affecting water for A.g. in the Johns.
Saries morgan, D.D. 10/11/0	Levelted to serve they.  Community & department, in  sand wearingful fashion
Dr. Daniel L. Morgan	Community & department, in
	sank meanwhil fashion
gusin R. Schuste 10/11/	of the process was excellent-
	and Thorough and
,	Seached The latere Commer -
Sabol Amts 11-8-01	Seached The Interio Commun-
Java 3 11-8-61	We look forward to working
Deborah J. Smith	with the City to make water
	a safe and sustainable resource
	for this region.

#### **IPWP Steering Group**

Monica Avila, Pacoima Neighborhood Watch

Andrew H. Barrera, Valley Economic Development Center, Inc.

Deborah Berg, Women's Transportation Seminar

Sheila H. Bernard, Lincoln Place Tenants Association

Charles Brink, Resident of Van Nuys

Maria Lou Calanche, USC - Civic & Community Relations

Charles Church, Resident of Canoga Park

Joe Coria, Boyle Heights Chamber of Commerce

Curt Curtiss, Westchester Vitalization Corporation

James R. Davis, II, National Institute for Communities Enlightenment

Rocky Delgadillo, Resident of Los Angeles

Carlos Ferreyra, Valley Glen Neighborhood Association

Steve Fleischli, Santa Monica Baykeeper

Gary Futral, Engineering Contractors Association

Judy Garris, Santa Susana Mountain Park Association

Mark Gold, Heal the Bay

Charles Gremer, West Hills Property Owners Association

Dorothy Green, Los Angeles - San Gabriel Rivers Watershed Council

Mary Hambel, City of Culver City/RBF

Phillip C. Hagar, Apartment Association of Greater Los Angeles

Jonathan Hou, California Chinese American Association of Construction Professionals

Julie Inouye, Vista Del Mar Neighborhood Association

John S. Lang, South Shores Homeowners Association

Larry Lehtihalme, Resident of Granada Hills

Domingo F. Leon, Society of Hispanic Professional Engineers, Inc.

Andy Lipkis, Tree People

William G. Luddy, Carpenters/Contractors

Elsa Lopez, Madres de Este de Los Angeles/Santa Isabel

Cherie Mann, North Valley Coalition

Gretchen Martin, Resident of Chatsworth

Lucia M. McGovern, West Basin Municipal Water District

Daniel L. Morgan, Guidance Church of Religious Science

Cindy O' Connor, League of Women Voters of Los Angeles

Manuel Padron, Resident of Marina Del Rey

Ray Pearl, Building Industry Association

Johnnie Raines, 8th District Empowerment Congress

Lynne Joy Rogers, Los Angeles Urban League Business

William T. Savage, Jr., Westwood Hills Property Owners Association

Linda Scheid, Miracle Mile Apartment Association

Judith L. Schwartze, Central City Association

Jayne Shapiro, Resident of Encino

Deborah J. Smith, Regional Water Quality Control Board

Wesley Staples, Cahuenga Hills Tennis Condominiums

Bruce Steele, Occidental College

Jesse C. Taylor, Jr., SEIU Local 347

Charles A. Tolbert, New Life Academy/Apostolic Faith Home Assembly

**Zigmund Vays**, Community Enhancement Services

Victor N. Viereck, North Hollywood Residents Association

Alonzo Villarreal. La Collectiva

Polly Ward, Studio City Residents Association

Geraldine Washington, NAACP

Brian Whelan, US Army Corps of Engineers

Elenore A. Williams, Habitat for Humanity

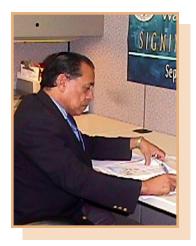
Scott Wilson, North East Trees

#### IN MEMORIUM

Robert Manning 1962 - 2001

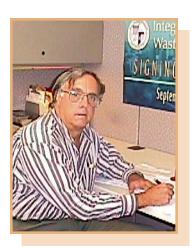
Johnnie Raines 1925 - 2001

They helped realize this vision for a better Los Angeles



# **Domingo F. Leon**Society of Hispanic Professional Engineers, Inc.

"It was a great honor to represent the Hispanic constituents in the Steering Group to assess the future of the Wastewater Plan of L.A."



#### Phillip C. Hagar Apartment Association of Greater Los Angeles

"This is just the beginning of the journey."



#### Cherie Mann

North Valley Coalition

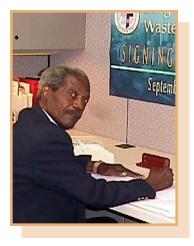
"You give hope for the future. Thank you."



**Curt Curtiss** 

Westchester Vitalization Corporation

"Now to implement."



#### Johnnie Raines

8th District Empowerment Congress

"Happy to have been a part of the program."

**Deborah Berg**Women's Transportation Seminar

"Thank you for the opportunity to participate in this impressive effort."



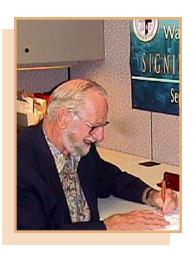
**Lucia M. McGovern**West Basin
Municipal Water District

"It was great to provide input on something very vital to the city's infrastructure."



Scott Wilson North East Trees

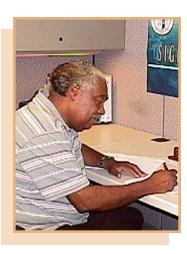
"Now to implement the vision."



Charles A. Tolbert

New Life Academy/ Apostolic Faith Home Assembly

"Thanks for the opportunity to be a part of making history. I've learned a lot."





Mark Gold Heal the Bay

"Heal the Bay is eager to help the City implement this progressive vision."





Julie Inouye Vista Del Mar Neighborhood Association

"Thank you for being leaders in this "New Direction" for the City of L.A. Now, let's make our ideas become reality!"



**Polly Ward**Studio City Residents Association

"I'm impressed by the outreach into the greater community."



**Andy Lipkis** Tree People

"This is the exact integration of programs that Tree People has been pushing for 10 years. We're here to make it happen."



Charles Brink Resident of Van Nuys

"A good first start."



**Zigmund Vays**Community Enhancement Services

"It was a great example of productive team work."



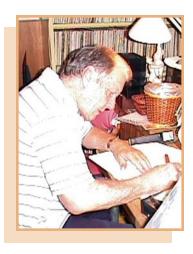
Cindy O'Conner League of Women Voters of Los Angeles

"Exactly the way public business should be done."



**Charles Church** Resident of Canoga Park

"Thank you for trying to prepare for the future."



**Charles Gremer** 

West Hills Property Owners Association

"Keep up the good work. You've given me a lot of education. I hope I helped you out."



Steve Fleischli

Santa Monica Baykeeper

"Let's settle that sewage case!"



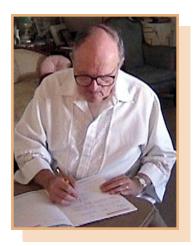


Sheila H. Bernard

**Lincoln Place Tenants Association** 

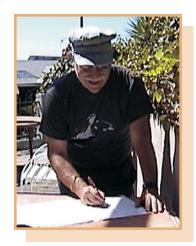
"I don't want Los Angeles to die of thirst. We need to handle water in a new way."





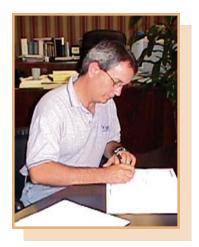
William T. Savage, Jr. Westwood Hills Property Owners Association

"We were very fortunate to have a group of advisors to lead us through the labyrinth to better use of our resources."



John S. Lang
South Shores
Homeowners Association

"Let's build it right!"



**Gary Futral** 

Engineering Contractors Association

"Relying on our infrastructure."



James R. Davis, II

National Institute for Communities Enlightenment

"This is a good start."



**Dorothy Green** 

Los Angeles-San Gabriel Rivers Watershed Council

"The process has been extraordinary. Keep up the good work."



**Linda Scheid**Miracle Mile Apartment Association
"Let's keep the process

going. Great start."



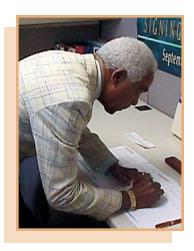
Elenore A. Williams
Habitat for Humanity

"I was proud to participate in this very important project affecting water for L.A. in the future."



**Dr. Daniel L. Morgan**Guidance Church
of Religious Science

"Delighted to serve the community and department in some meaningful fashion."



Judith L. Schwartze Central City Association

"The process was excellent and thorough and reached the entire community of stakeholders."





**Deborah J. Smith** Regional Water Quality Control Board

"We look forward to working with the City to make water a safe and sustainable resource for this region."



### Glossary of Terms

#### Basin

A drainage area whose boundary is dictated by gravity flow.

#### Beneficial uses

Designations for water bodies that (in California) Regional Water Quality Control Boards establish so appropriate water quality objectives can be established for that water body. The designated beneficial uses, together with water quality objectives form water quality standards. Such standards are mandated for all water bodies within the state under the California Water Code. In addition, the federal Clean Water Act mandates standards for all surface waters, including wetlands. In the Los Angeles Region, there are 24 Beneficial Use designations. Example designations include Municipal and Domestic Supply (MUN), Water Contact Recreation (REC-I), Wetland Habitat (WET), and Marine Habitat (MAR).

#### Best Management Practice (BMP)

Any program, technology, process, siting criteria, operating method, measure or device that controls, prevents, removes, or reduces pollution.

#### **Biosolids**

Solid materials resulting from wastewater treatment that meets government criteria for beneficial use, such as for fertilizer.

#### Class A biosolids

A designation established by the U.S. Environmental Protection Agency in the Standards for the Use or Disposal of Sludge (40 CFR 503), in which disinfection processes reduce pathogen levels in biosolids to "below detectable levels."

#### Collection system

The network of piping and pumping stations that conveys raw wastewater (sewage) from homes, businesses, etc., to a facility for treatment.

#### Composting

An enhanced process of rapidly oxidizing a solid material using atmospheric oxygen.

#### Conservation

Act of using the resources only when needed for the purpose of protecting from waste or loss of resources.

#### Conserve

To save a natural resource, such as water, through intelligent management and use.

#### Constructed wetlands

Wetlands that are designed and built similar to natural wetlands; some are used to treat wastewater. Constructed wetlands for wastewater treatment consist of one or more shallow depressions or cells built into the ground with level bottoms so that the flow of water can be controlled within the cells and from cell to cell. Roots and stems of the wetland plants form a dense mat where biological and physical processes occur to treat the wastewater. Constructed wetlands are being used to treat domestic, agricultural, industrial, and mining wastewaters.

#### Contamination

The state of being contaminated or impure (not pure) by contact or mixture; the state of having a substance introduced into the air, water, or soil that reduces its usefulness to humans and other organisms in nature.

#### Contracting cities/agencies

Neighboring cities or agencies in the Los Angeles area that rely on the City of Los Angeles to provide wastewater treatment and disposal services, through a formal agreement.

#### Discharged

Released into a water body.

#### Disposal

A disposing of or getting rid of something, as in the disposal of waste material.

#### Downstream

In the direction of a stream's current.

#### Dry weather urban runoff

Runoff to the storm drain system that occurs when there is no measurable precipitation. Typically includes flows from car washing, landscape irrigation, street washing, dewatering during construction activities, and illicit connections and dumping into the storm drains.

#### Dynamic hydraulic model

A computer program designed to simulate how a system performs over time, under varying flow conditions.

#### **Effluent**

Treated water (or product) leaving a facility.

#### Environmental justice

The fair treatment of people of all races, cultures and income levels with respect to the development, implementation and enforcement of environmental laws, regulations and policies.

#### Glossary of Terms

#### Environmental Protection Agency (EPA)

The U.S. agency responsible for efforts to control air and water pollution, radiation and pesticide hazards, ecological research, and solid waste disposal.

#### Gravity

The force of attraction, characterized by heaviness or weight, by which terrestrial bodies tend to fall toward the center of the earth.

#### Groundwater

Water that infiltrates into the earth and is stored in usable amounts in the soil and rock below the earth's surface; water within the zone of saturation.

#### Groundwater discharge

The flow or pumping of water from an aquifer.

#### Groundwater recharge

The addition of water to an aquifer.

#### Habitat

The arrangement of food, water, shelter, and space suitable to animal's needs.

#### Impermeable

Impassable; not permitting the passage of a fluid through it.

#### Industrial source control program

An established pre-treatment program for industries, which requires removal of constituents from their wastewater before it enters the City's wastewater collection system, i.e., the pollutants are removed or controlled by the generator (or user) rather than by the City.

#### Infiltration

See Rainfall-Dependent Infiltration (RDI)

#### Inflow

That portion of precipitation that enters sewers through holes in maintenance holes and through roof leaders by illegal connection.

#### Infrastructure

The underlying foundation or basic framework of a system.

#### Maintenance hole

An opening that allows a person to gain access to a structure.

# National Pollutant Discharge Elimination System (NPDES)

Part of the Clean Water Act requiring municipal and industrial wastewater treatment facilities to obtain permits which specify the types and amounts of pollutants that may be discharged into water bodies.

#### National Water Quality Standards

Maximum contaminant levels for a variety of chemicals, metals, and bacteria set by the Safe Drinking Water Act.

#### Natural resource

Something (as a mineral, forest, or kind of animal) that is found in nature and is valuable to humans.

#### Non-permeable surfaces

Surfaces that will not allow water to penetrate, such as sidewalks and parking lots.

#### Onsite retrofits

Improvements or management practices that manage runoff before it reaches the storm drain system.

#### **Percolation**

The gradual downward flow of water from the surface of the earth into the soil.

#### Percolation studies

Investigations to determine how much water can flow from the surface of the earth into the soil.

#### Pilot tests

Small-scale applications intended to demonstrate the applicability of a process if applied in a larger scale.

#### **Pollutant**

An impurity (contaminant) that causes and undesirable change in the physical, chemical, or biological characteristics of the air, water, or land that may be harmful to or affect the health, survival, or activities of humans or other living organisms.

#### **Population**

The organisms inhabiting a particular area or biotope.

#### **Potable**

Fit or suitable for drinking, as in potable water.

#### Rainfall- Dependent Infiltration (RDI)

Rainfall runoff that enters a sewer system and service connections from the ground during, after, and as a result of a rainfall event, through such sources as (but not limited to) defective pipes, pipe joints, connections, and maintenance holes.

#### Recharge

Replenish a water body or an aquifer with water.

#### Reclaim

To return to original condition.

#### Reclaimed water

See recycled water

#### Glossary of Terms

#### Recyclable

In the context of the IPWP, refers to wastewater flows to plant sites that either have recycling facilities or could accommodate them, or to flows from Hyperion that could be exported to West Basin Municipal Water District for additional treatment. For the IPWP, the total 2020 "recyclable" flows were estimated to be 420 million gallons per day.

#### Recycled water

Treated wastewater that can be used to offset potable drinking water use. Recycled water can be used for irrigation, industrial uses and groundwater recharge.

#### Regional Board

Regional Water Quality Control Board (RWQCB): California agencies that implement and enforce Clean Water Act NPDES permit requirements, and are issuers and administrators of these permits as delegated by the EPA. There are nine regional boards working with the State Water Resources Control Board.

#### Reuse

To use again, especially after reclaiming or reprocessing.

#### Riparian

Relating to or living or located on the bank of a natural watercourse (as a river) or sometimes of a lake or a tidewater.

#### River

A large natural stream emptying into an ocean, lake, or other water body.

#### Runoff

Water that flows across surfaces rather than soaking in; eventually enters water body; may pick up and carry a variety of pollutants.

#### Sewage

Liquid waste conveyed in a sewer; wastewater

#### Sewer

A pipe or conduit constructed or installed to convey wastewater.

#### Stakeholder

Someone with an interest or share in a process or project outcome.

#### Stormwater

Runoff caused by rainfall.

#### Stormwater system

The system used for the collection of wet weather urban runoff.

#### **Thematic**

Of, or relating to, a specific and distinctive quality, characteristic or concern.

#### Treatment plant

Facility for cleaning and treating fresh water for drinking, or cleaning and treating wastewater before discharging into a water body.

#### **Upstream**

In the opposite direction of a stream's current.

#### Urban runoff

See runoff.

#### VSL/SA

Valley Spring Lane/Forman Avenue

#### Wastewater

Spent water after homes, industries, commercial establishments, public places, and similar entities have used their water.

#### Wastewater treatment

Physical, chemical, and biological processes used to remove pollutants from wastewater before reusing or discharging it into water body.

#### Water conservation

Practices that reduce water use.

#### Water cycle

The cycle of the earth's water supply from the atmosphere to the earth and back, which includes precipitation, transpiration, evaporation, runoff, infiltration, and storage in water bodies and groundwater. Also referred to as the "hydrologic cycle".

#### Water quality

The condition of water with respect to the amount of impurities in it.

#### Watershed

Land area from which water drains to a particular water body.

#### Wet weather urban runoff

Water (originating as precipitation) that flows across surfaces rather than soaking in; eventually enters water body; may pick up and carry a variety of pollutants.



































































Camp Dresser & McKee and CH2MHILL in cooperation with the City of Los Angeles

# Appendix C Sewer Flow Estimating Model (SFEM) Calibration

# **Background:**

Sewer Flow Estimating Model (SFEM) calibration was performed to compare estimated flows with actual flows for the current conditions. The primary objective of the calibration was to verify model parameters that are used in the flow estimation process.

This document provides high-level approach for SFEM calibration. Where the model calibration is broken down in three levels:

Level 1: Service Area Flows - Hyperion and Terminal Island

Level 2: Treatment Plant Flows

Level 3: Major Outfall Flows

The Level-1 calibration validates flow rates and helps confirm parameters for various flow components. Level-2 and 3 helps better understand network configuration for flow bypasses at treatment plants and diversion/split setups within primary sewer network.

# **Data Sources and City Standards:**

This section highlights input data sources and flow estimating concepts that are adopted by the City. The data components listed here are selected key components that make up for estimated wastewater flows.

The source data used in the SFEM assumed to be correct and representative of the field conditions as closely as possible. Following is the list of the SFEM data set inputs hat affects flow estimates.

- Census Population
- Residential and Employment Rates
- Industrial Discharges
- Groundwater Infiltration
- Physical Network
  - 1. Sewer Network and Connectivity
  - 2. Flow Splits/Diversion Setups

The following diagram represents wastewater flow components as defined in the City Sewer Design Manual. Population based flows, Groundwater infiltration and Industrial flows make up total wastewater flows. The following equation represents average dry weather flow (ADWF) in gallons per day (gpd). Residential and Employment flow rates are used as defined in the City Sewer Design Manual.

ADWF = (ResPop \* ResRate + EmpPop \* EmpRate) + GWIFlow + IndFlow

Where;

ADWF = Estimated Average Dry Weather Flow

ResPop = Residential Population

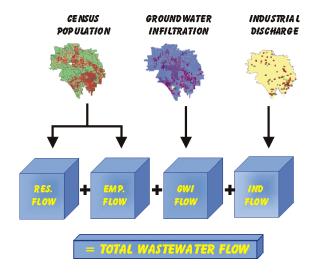
ResRate = Flow rate for residential population

EmpPop = Employment Population

EmpRate = Flow rate for employment population

**GWIFlow** = **Groundwater Infiltration** 

IndFlow = Industrial Flows (Permitted flow > 10,000 GPD)



The field data required to support the calibration effort is as follows:

#### 1. Flow Gauging

- a. Locations: Selected flow gauging locations on feeder lines to the major outfalls, bypass structures and major diversion structures.
- b. Gauging period: Flow gauging should be over a period of time, at least over a week, representing dry weather condition.

#### 2. Treatment Plant Flows

- a. Plant flows and sludge return: Flow measurements over a period of time during dry weather. Average daily flow values for at least three months or over.
- b. Average flow over time: Average daily value of flow measurement over a longer period should be used for calibration.

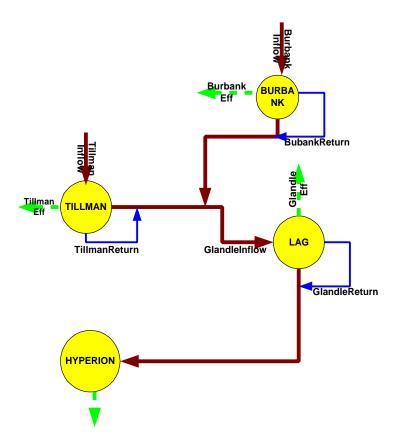
#### 3. Flow Splits and Siversion Settings:

Current settings: Representing the network configuration when flow gauging were performed.

### **Model Calibration:**

The following are suggested levels of calibrations. The model calibration is divided into three levels of calibration and should be performed from high-level (Level-1) to low-level (Level-3).

Level-1: Service Area flows- Hyperion and Terminal Island



Level-1 is at the service area flows. As Hyperion and Terminal Island are two independent service areas, the flows for both Hyperion and Terminal Island treatment plant are estimated and compared with measured flows at the plants.

Net flow for Hyperion Service Area (HSA) is calculated based on average of plant measurements over a period of time and by applying the following equations.

Hyperion Service Area Net Flow:

HSANet = (TillmanInflow + GlendaleInflow + BurbankInflow + HyperionInflow) - (TillmanSludgeReturn + GlendaleSludgeReturn + BurbankSludgeReturn)

Terminal Island Service Area Net Flow:

TERMINALISNet = TerminalISInflow

#### **Level-2: Treatment Plant Flows**

Level-2 flow calibration is performed at individual treatment plant levels. For each of the three; Tillman, Glendale, Hyperion, treatment plants in Hyperion Service Area, the flows should be estimated for current years and compared with average plant flows.

This step will require defining treatment plant service areas by investigating various flow splits and bypass that effects the service area definitions. Flow gauging information will help define bypass settings and flow split configurations.

#### Level-3: Major Outfall Flows (Use flow gauging locations.)

Level-3 flow calibration is similar to level-2 calibration, except it will be using more basins smaller in size. Here basins can be defined to match MOUSE basins or service areas tributary to permanent flow gauging locations. This level of calibration will require extensive use of flow gauging information and require researching flow splits that effects the basin definition.

#### **Observations: Level-1**

As discussed earlier, Level-1 calibration was performed by collecting historical treatment plant flows and comparing against estimated flows.

#### **Treatment Plant Flows**

The following table summarizes the historical flows from 1987 through 2000. This yearly summary is derived by averaging monthly flows in a given year. The total Hyperion service area flow is calculated by adding flows from TWRP, LAG, BWRP and HTP plants.

Year	Historic Plant Flow MGD (Total HSA)		
1987	431		
1988	423		
1989	423		
1990	413		
1991	377		
1992	387		
1993	412		
1994	405		
1995	426		
1996	434		
1997	438		

Year	Historic Plant Flow MGD (Total HSA)			
1998	451			
1999	425			
2000	426			

#### **Estimated Flows**

The following table summarizes the results from the SFEM runs for year 2000 ADWF calculation. Where Residential and Employment population is based on Census data. Industrial flows are based on industrial permit records, where industries with discharge greater then 10,000 GPD. The GWI flows are average GWI flows, which are originally based on GWI study completed in early 90's.

Year	2000
RES GPCD	81
EMPGPCD	24
RESPOP (millions)	4.1
RESGPD (MGD)	335.7
EMPPOP (millions)	2.3
EMPGPD (MGD)	55.6
PTSOURCE (MGD)	24.8
GWI (MGD)	29.9
ADWF_GPD (MGD)	445.9

#### Flow Comparison

Historical flow data from the City's wastewater treatment plants were reviewed and evaluated to identify the trend of flow rates over time. Figure 4-4 shows HSA and TISA historical and projected ADWFs.

For the year 2000, HSA shows a theoretical flow of about 433 mgd using the per capita rates of 81 gpcd for residential flows and 24 gped for commercial flows. The 446 includes industrial flow and a GWI flow component in addition to the residential and commercial flows. Comparing this to a measured annual average flow of 426 mgd, there is a four percent difference between the theoretical and annual average flows, which is a reasonable and acceptable difference for calibration.

### **Discussion**

Similarly Level-2 and Level-3 calibration should be performed to help refine SFEM configuration to better represent field conditions. These more detailed calibrations will help define flow routing through primary network and also highlight variation in localized system characteristics.

It is important to remember that after going through calibration process and making applicable changes to physical network to represent field conditions, the estimated flows may not match with gauged flows. This could be due to many reasons. As indicated, the estimated flows are made up of various components, and one or many components could differ from real-life situation. It is not advisable to change the flow rates or any other flow components arbitrarily without going through appropriate study-supporting change in field conditions and it's likelihood of continuation in future. For example, the per capita flow rates may have been reduced due to water conversation or change in consumption patterns, which should only be concluded by an appropriate study and acceptance from management.

# Appendix D Computer Modeling for the City of Los Angeles Outfall Sewer System

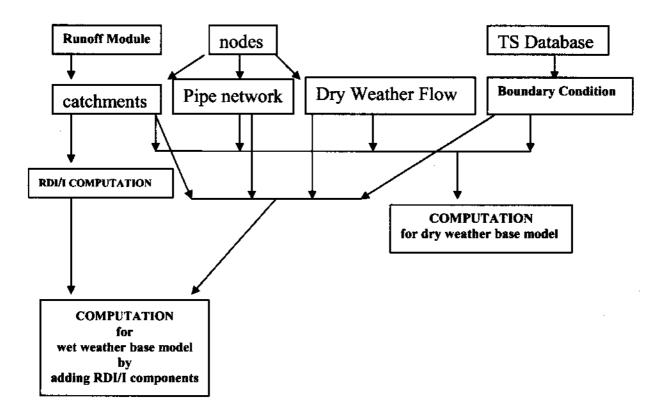
# Computer modeling For The City of Los Angeles Outfall Sewer System

The City of Los Angeles provides services to 3.5 million people in about 650 square miles of service area. It owns and operates a collection system that consists of 6500 miles of sewers varying in size from 8 to 150 inches in diameter and numerous sewer appurtenances such as diversion structures and inverted siphons.

It was realized that a collection system model is needed to obtain overall comprehensive information for City's complicated wastewater collection system. Wastewater Engineering Services Division (WESD) has developed and maintains a sophisticated computer model of the wastewater collection system. The development of base model for both dry weather and wet weather conditions is hereby presented to facilitate updating model database in the future. In addition, this document is also required under CDO No. 00-128 for the purposes of model verification and hydraulic capacity analysis.

Model of Urban Sewer System (MOUSE) is a state-of—the-art hydraulic modeling software package designed to simulate unsteady flow in pipe networks. It was developed by the Danish Hydraulic Institute (DHI) and introduced to the United States in the early 1990s. MOUSE is, currently, the most widely used, commercially available, fully dynamic software for collection system analysis. The City's MOUSE model was originally developed in 1995-6 in response to the need for a planning and analysis tool. MOUSE package consists of many modules: hydrodynamic, surface runoff, real time control, rain dependent inflow/infiltration and water quality etc. the combination of modules will be varied for different purpose. For example: the scenario of consecutive storms needs a combination of hydrodynamic, surface runoff, and rain dependent inflow/infiltration to simulate the compound effect of storms.

A complete data set used by MOUSE consists of various input files and databases. MOUSE data are organized into a number of files (and databases). Each file (database) contains a set of data belong to a specific category. MOUSE use 'project' to select proper input files (databases) to perform computation. Therefore, for different purpose, input files (databases) may vary based on the needs. Following is an input files scheme to depict the difference in terms of input data set between dry weather base model and wet weather base model.



As shown above, the wet weather component (RDI/I) is added on the dry weather flow to generated wet weather flow. This document consists of two parts: dry weather base model and wet weather base model. In part one – Dry weather base model, we will discuss all components but runoff module and RDI/I computation. In part two – Wet weather base model, we will focus on the discussion of these two components.

# PART ONE Dry Weather Base Model

#### Introduction

Base model is always the first model that has to be established prior to any applications. Base model, herein, is defined as the scenario of current conditions. In other words, input data such as pipe network, system operation strategies, and flow generation of each subbasin should be close to the results of field investigation. That makes model verification possible through the comparison of field results with model runs. The fabrication of input data files, model verification and modification in each stage will be documented in details so that the reliability of the modeling results can be no doubt.

#### **Model Fabrication**

#### Pipes and Nodes

Dimensions of pipes, inverts and ground elevations of nodes, were taken from the inventory component of the City of Los Angeles Sewer Information and Maintenance System (SIMMS). Coordinates of nodes were taken from the GIS sewer network coverage. Special pipe Cross-Sections such as semi-elliptical, oval, and Bruns-McDonnel are all customized.

Data extracting from SIMMS and GIS was copied to a MOUSE readable text file and then data can be imported and converted to a MOUSE sewer network file.

#### Catchments

The overall Hyperion Service Area was sub-divided into 350 sub-basins (see Figure 1). GIS has been used as a tool for defining the sub-basins. The service area in acres can be obtained immediately from the GIS attribute table. For population (or its projection) in sub-basins, the sub-basin layer was overlaid with the population layer and population of sub-basins can be obtained by a tool built in ArcView Spatial Analyst.

#### **Dry Weather Flow Generation**

Dry weather flow contains four components: residential flow, commercial flow, industrial discharge, and groundwater infiltration. Although these four components can be distinctively identified in GIS, current MOUSE model can only calculate dry weather flow based on "population" or "acres". Therefore, "equivalent population" has been used to incorporate all components into one factor (i.e. equivalent population). Gallon per capita per day for residential flow and commercial flow are 78 and 23 respectively. Industrial flow consists of 109 point sources that have daily discharge more than 50000 gallon per day. For dry weather condition, the GWI is neglected. The total flow in gallon generated in each individual catchment is

subdivided by 100 to get equivalent population that is the number input into MOUSE model.

#### Diurnal curves

The variations in wastewater flows tend to follow a somewhat diurnal pattern. Flow rate actually is a function of time. Lowest flows could be close to zero in some area and peak flows, in most cases, are double or triple of the average. From place to place, Diurnal patterns are different. Twenty-three diurnal patterns were selected to represent three hundred fifty sub-basins' flow patterns (see Figure 3). The selected locations (marked red in Figure 3) were gauging and hourly flow rates were converted to dimensionless coefficients by normalizing flow rates with the average.

#### **Other Hydraulic Settings**

Modeling of overflow weirs, pump's wet wells and other flow control structures were based on the City's As-Built records. For operation purpose or some other unknown reasons, current settings, in most cases, are different from the original drawing. Major diversion structures and treatment plants in-take need to be calibrated to properly simulated measured flow.

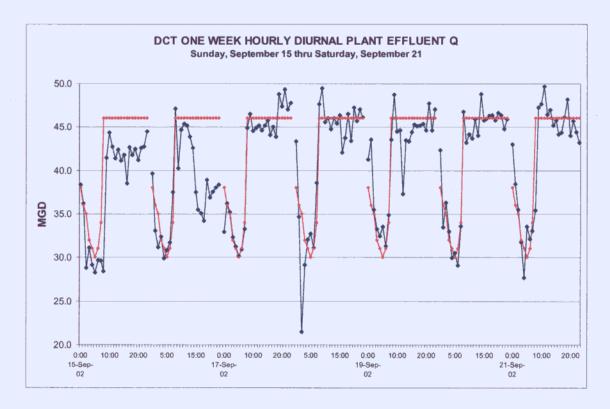
#### **Model Verification / Calibration**

#### The Calibration of Dry Weather Base Model

Since collection system has been improved from time to time and the system operation also changes to match the system change, collection system model must be up-to-date periodically to keep its validation. WESD updates and verifies its MOUSE model in every another year.

Base model is calibrated according to field flow measurements. Total wastewater volume, peak/low flow and peaking time are the criteria used to verify dry weather base model. Good match between field measurements and MOUSE model results is needed. Tributary areas, diurnal curves, flow splits, pumping strategies, and many other factors that may cause the modeling results deviated from field measurements shall be carefully adjusted until the results are matched within 15 %.

#### 1. Tillman Plant In-take

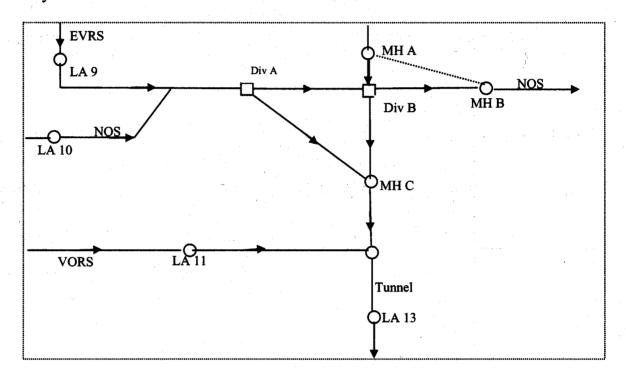


The typical weekly effluent hydrograph (blue line) and model's effluent pumping curve (red line) are shown on above diagram. Model can not exactly duplicate the real effluent, but it is able to have a pumping curve to represent the significance of the effluent.

In general, the pumping curve starts with 38 mgd and gradually drops to 30 mgd at 5:00 a.m., then it raises in a relatively faster speed to 46 mgd at 8:00 a.m., this pumping rate will lasts until 11:00p.m.

# 2. Valley Spring and Foreman Diversion Structure The diversion structure at the intersection of Valley Spring Lane and Forman Avenue is the most important flow diversion structure for City's wastewater

collection system. It control the distribution of 40 MGD flow generated from San Fernando Valley daily and the flow through the structure could be up to 80 MGD during a significant storm. Without an appropriate control, the excessive flow may cause wet weather overflows at MAZE area and LCIS.



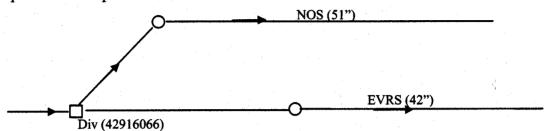
As shown in above sewer scheme, EVRS (also known as sludge line) and NOS are jointed at the west of Div A. VORS by pass the diversions and flow directly to the LA 13. The diversion structures can redistribute flows from EVRS and NOS. Based on the historical flow data, it was found that the flow diverted to the tunnel is correlated with the total inflow. During the dry weather condition, its low end is 40% (or 17 cfs) and its high end is 60% (or 45 cfs). During a storm, its low end is 40% (or 20 cfs) and its high end is up to 70% (or 70 cfs).

To match field measurements, following settings are assigned:

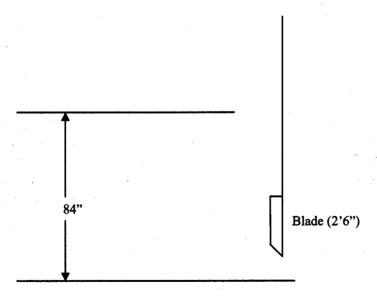
- Div A is a diversion with flow split ratio
- Div B is a diversion with on/off function
- A non-return regulator in pipe between Div A and MH C to prevent backflow
- A overflow weir at MH A (to MH B)

# 3. Magnolia & Kester Diversion Structure AVORS ends at MH 42916066 (the junction of AVORS, EVRS, and NOS), the pipe size is constricted from 84" (AVORS) to 42" (EVRS). NOS is the relief line

to accept excessive flow diverted from AVORS. Following is the flow scheme to depict the flow split.

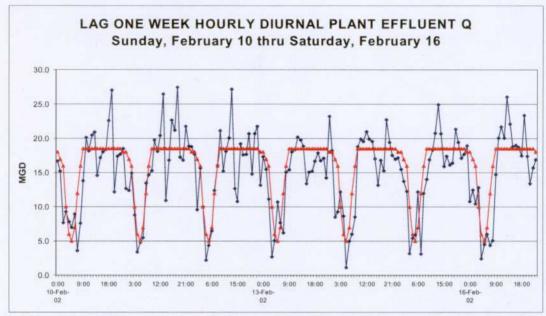


The hydraulic device used for this diversion is a flow control sluice gate as shown below. The blade can move up/down to control water level so that excessive flow during the high flow can be overflow to NOS.



In City's MOUSE model, we model this flow control sluice gate by using a overflow weir and a underflow gate.

#### 4. LA/Glendale Plant In-take

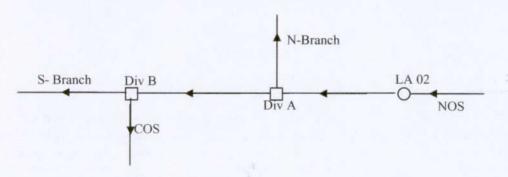


The typical weekly effluent hydrograph (blue line) and model's effluent pumping curve (red line) are shown on above diagram. As mentioned, model can not exactly duplicate the real effluent, but it is able to have a pumping curve to represent the significance of the effluent.

In general, the pumping curve starts with 18 mgd and gradually drops to 5 mgd at 5:00 a.m., then it raises in a relatively faster speed to 18.5 mgd at 9:00 a.m., this pumping rate will lasts until 10:00p.m. and it will drop back to 18 mgd at 11:00 p.m. This is existing condition of LA/G effluent. For further effluent reduction, for example 9 mgd, the current flow higher than 9 mgd will be reduced to 9 mgd and the flow lower than 9 mgd will be kelp the same.

#### 5. Maze Diversion Structures

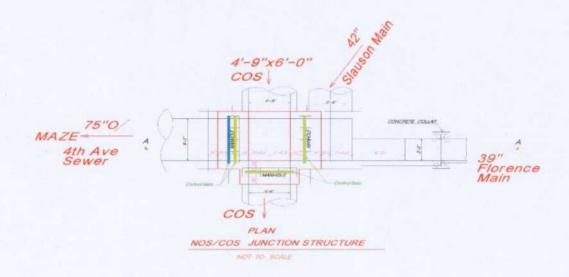
Wastewater flow at the west side of LA 02 is distributed into three different branches: N-Branch, S- Branch, and COS. The diversion structures at div A and div B are two devices used to ensure that flow fill the N-Branch first during the low flow period, and then it will fill S-Branch, the excessive flow during the peak flow period then overflow to COS. Following is the flow scheme to illustrate this flow distribution.

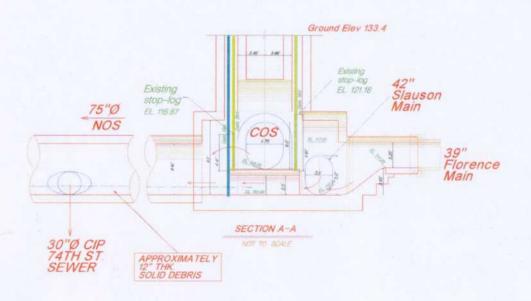


Stop logs are used to control the flow into N-branch and S-branch. Its principle is very similar to the flow control sluice gate described previously. Since the flow redistribution is accomplished by raising the water level, d/D at those two diversion structures and their vicinity is very high during the dry weather peak. Flow monitor at LA 02 indicates that dry weather peak d/D is about 0.8 in most cases.

#### 6. NOS/COS Junction Structure

This junction structure is used to allow two trunk sewers to go down under the COS to reach S-branch. In the meantime, a weir adjusted by stop logs is used to allow overflow from the COS to S-branch in case that COS has too much flow. Followings are the plan and the profile of this junction structure:

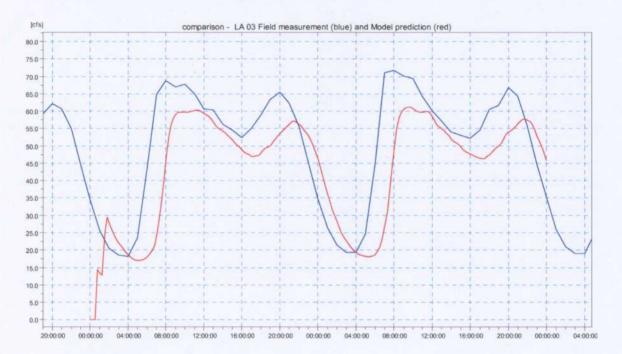




#### **Model Verification**

Measurement data from 33 ADS flow monitors was used for comparison with results computed by the model. In this way, the accuracy after model calibration and model's stability under different scenarios could be verified. However, due to the malfunction of some flow monitors, the comparison for all ADS flow monitors is impossible. The dry weather flow was calibrated by adjusting parameter values until the hydrograph peaks matched within 15 %.

#### 1. Case 1. Flow simulation for April 15, 12:00 a.m. to April 17, 12:00 a.m.



Appendix E
Potential Impacts of MF/RO Brine
Discharge Technical Memorandum



# Technical Memorandum: Potential Impacts of MF/RO Brine Discharge to Sewer

To: Chuck Turhollow, City of Los Angeles, Bureau of Sanitation

Project Manager, Los Angeles Integrated Resources Plan

From: Paul Gustafson, CH:CDM

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Task Manager, Treatment

Scott Lynch, CH:CDM

Task Manager, Recycled Water

Date: November 7, 2003

#### **Abstract:**

This technical memorandum summarizes a preliminary investigation into the possible affects to the Hyperion Treatment Plant (HTP) and the upstream collection system caused by discharging brine generated from upstream microfiltration (MF) and reverse osmosis (RO) facilities. The purpose of this technical memorandum (TM) is to provide preliminary confirmation that discharge of brine to the sewer is a possibility without large impacts downstream. The memorandum will: (1) provide a brief background and introduction to the brine issue with respect to the Integrated Resources Plan Alternatives; (2) summarize some of the potential options for disposal of the brine; (3) provide the modeling results of possible affects on the collection system; (4) provide Hyperion Service Area (HSA) mass balance for total dissolved solids , total suspended solids and total nitrogen; and (5) provide a preliminary opinion of possible affects to the treatment at HTP.

# **Background**

As part of the analysis of the integrated alternatives, the IRP team is considering the upgrade of the Donald C. Tillman Water Reclamation Plant (TWRP) and the Los Angeles-Glendale Water Reclamation Plant (LAGWRP) to advanced treatment. The team is also considering advanced treatment for possible new water reclamation plant (s) (NWRP). For the purposes of the discussion within this technical memorandum, we will assume that the advanced treatment is a combination of MF and RO membranes.



A byproduct of treatment with MF/RO membranes is a waste stream ("brine") containing the concentrated constituents that do not pass through the membranes. The disposal of brine could pose a number of unknown technical, political and regulatory questions, which are not fully known at the present. These unknowns can significantly affect the treatment system. As part of the alternatives analysis process, the IRP team considered the option of discharging the brine to the collection system for treatment and disposal at Hyperion Treatment Plant (HTP). At this time, this option can only be considered as an interim or temporary disposal method given the need for more study and information before this issue can be essolved.

This analysis focuses on three constituents:

- Total suspended solids (TSS)
- ♦ Total dissolved solids (TDS)
- ♦ Total nitrogen (Total N)

There may also be issues related to metals and other toxins within the brine stream and their effect on the biosolids. These issues are currently being investigated by the Regulatory Affairs Division of the City and are included as part of this discussion.

This analysis was completed for the integrated alternatives being evaluated at the time of this TM. Attachment 1 includes a summary of these alternatives. Within the range of integrated alternatives being considered for the IRP, some of the upstream facilities are assumed to discharge to the Los Angeles River (LA River) (and must therefore have MF/RO) while others are assumed to not discharge to the LA River (and require Title 22 recycled water, tertiary treatment)(see Section 3.5.2 in the Wastewater Management Volume for more information). In determining the size of the facilities in the year 2020, the effective capacity of the Title 22 facilities was assumed to be zero because they would be forced to discharge back to the sewer when demand for recycled water was low. However, for TSS and Total N, the analysis was completed with the Title 22 facilities both operating and not operating (and discharging back to the sewer).

# **Options for Disposal**

As noted previously, there are many unknowns associated with brine discharge. These unknowns affect many municipalities in addition to the City of Los Angeles (City). The U.S. Bureau of Reclamation is currently conducting a study to examine these issues and to analyze potential regional solutions. This study is schedule to be completed at the end of 2004.

For the City, there are potential non-regional solutions. These include:

Discharging to the sewer for treatment at HTP.



- Building a separate brine line from TWRP to LAG and then to HTP for disposal via the existing five-mile outfall.
- Construction of a new ocean outfall independent of HTP. This outfall could be located in one of several places along the coast.

Along with these disposal options, there are technologies available, which could help to reduce the volume of the brine to discharge or disposal. The brine/concentrate disposal/reduction methods are divided into four categories for analysis: liquid disposal, liquid concentrating or volume reducing, crystallization, and other disposal methods. The liquid disposal processes exist as stand-alone processes that consist of a single-step disposal method. The liquid concentrating and crystallization processes can be used in differing combinations to achieve the desired result of a solid salt product for disposal. The processes and technologies that can be considered are:

#### Liquid disposal

- Deep well injection
- Downstream brine/concentrate treatment
- Liquid concentrating
- Land application/irrigation
- Natural treatment system
- Electrodialysis/electrodialysis reversal
- VSEP membrane system
- Precipitative softening/RO
- Vertical tube falling film evaporation
- HERO membrane system

#### Crystallization

- Forced circulation crystallizer
- Evaporation ponds/misters
- Percolation ponds



- Other disposal methods
  - Incineration
  - Landfill

The crystallization steps require disposal of the dry salts, typically to a landfill, and thus will require transport. Each technology/method or combinations of these have distinct advantages and disadvantages that can be site specific. A more detailed analysis of these should be conducted to determine, which, if any could be beneficial to the City's current and/or future conditions. For this analysis, CH:CDM is only evaluating the potential impacts with discharging brine to the sewer for treatment at HTP

# **Effects on the Collection System**

For each integrated alternative, the brine flows from the associated wastewater treatment facilities were calculated (as described below) and were compared to results of hydraulic model runs using the sewer flow estimating model (SFEM) and MOUSE models. The results of the analysis indicate that the primary hydraulic effect caused by the increased flow is on the sewer between TWRP and the Valley Spring Lane and Forman Avenue Diversion. The derating of TWRP from the nitrification/ denitrification upgrades as well as the increased flow in the Tillman Service Area is predicted to trigger construction of a new interceptor before the year 2020. The discharge of brine to the sewer will require that the new interceptor be six inches larger than if no brine were discharged.

### **Effects at HTP**

#### **Basis of Calculations**

All calculations were based on average removal efficiencies and mass balances both within each treatment facility as well as for the entire Hyperion Service Area (HSA). Attachments 1 through 5 provide details of these calculations. This analysis begins with the upstream water reclamation plants.

#### **Upstream Plant Information**

First, the quantity of the brine discharge from the facilities was estimated. This information was used to determine the effects on the collection system as well as to calculate the influent concentration at HTP. Brine generation quantities were based on assumed process efficiencies of 10 percent of the influent flow for MF and 15 percent of the influent flow for RO. Table 1 illustrates an example of the flow balance at TWRP.



Table 1 Example Flow Balance at a TWRP							
Description	Influent Flow	Waste Sludge or Brine Flow	Product Water Flow				
Secondary Treatment	80 mgd	5.3 mgd (6.6%)	74.7 mgd				
Advanced Treatment							
Microfiltration (MF)	74.7 mgd	7.5 mgd (10.0%)	67.2 mgd				
Reverse Osmosis (RO)	67.2 mgd	10.1 mgd (15.0%)	57.1 mgd				
Total Flow to Collection System		22.9 mgd (28.6%)					

Next, the mass of the constituents in the influent to the facility was determined. For flow, TSS and Total N the values developed in the Draft Interim Deliverable *Wastewater Management Volume, Section 4.4* were used (see Section 4.4 for more information on the determination of these values). For TDS, data from January 2002 to August 2003 was used.

Finally, the mass of each constituent that is discharged to the collection system for treatment at HTP was determined. The following summarizes these assumptions:

- ◆ TDS MF/RO would remove 90% of the total TDS mass.
- ◆ TSS A Title 22 facility would remove 94% to 96% of the total mass based on a discharge limit of 15 mg/l. A facility with MF/RO was assumed to remove 99% of the TSS mass.
- Total N There were two scenarios for Total N, with and without nitrification/denitrification (NdN) upgrades.
  - For the scenario with NdN, the total N removal through the aeration basins was assumed to be 74% to 78% of the total influent based on a discharge limit of 10 mg/L.
     MF/RO was assumed to remove 90% of the remaining mass not removed by the NdN. The amount of the nitrogen in the sludge was assumed to be about 7% of the total waste TSS.
  - For the scenario without NdN upgrades, the only removal assumed was 90% of influent mass by MF/RO treatment.

From these assumptions, the mass of each constituent discharged to the sewer was calculated.



#### **HSA Mass Balance**

The information calculated for the upstream facilities was then combined to determine the actual mass and flow of each constituent to HTP. The following formulas were used for these calculations:

HTP<sub>in</sub> = HSA<sub>in</sub> - Upstream Facility Influent + Upstream Facility Waste Sludge/Brine

Upstream Facility Influent = TWRP<sub>in</sub> + LAGWRP<sub>in</sub> + NWRP(s)<sub>in</sub>

Upstream Facility Waste Sludge/Brine = TWRP<sub>waste</sub> + LAGWRP<sub>waste</sub> + NWRP(s)<sub>waste</sub>

#### Results of the Analysis

#### HTP Influent Results

Tables 2 through 5 summarize the results of the mass balance calculations for each constituent for increases to the year 2020. When comparing the results for each alternative and constituent, it is important to consider also the increase in flow to HTP as well as in the HSA. The influent flow at HTP and for HSA is projected to increase by an average of 25 and 21 percent respectively over the integrated alternatives.

For TDS, the results show an average increase in influent mass to HTP of about 32 percent. This translates to an average increase in the influent concentration of about 73 mg/L. Considering that the flow within the HSA increases by about 21 percent, then the true increase in TDS from the addition of MF/RO is about 11 percent.

For TSS, the results show an increase in mass to HTP of about 20 percent. This value is consistent with the increase in flow within the HSA and it may actually decrease the concentration slightly based on an increased ratio of flow to HTP.

For Total N with NdN, the results show an increase in mass to HTP of about 21 percent assuming that the Title 22 facilities are treating flow. This value is consistent with the increase in flow within the HSA. Note that if the Title 22 facilities are not treating flow (bypassing to the sewer) the increase in mass is about 22 percent. Basically, these results indicate that the removal of nitrogen by NdN makes up for the increased capture of the RO membranes.

For Total N without NdN, the results show an increase in mass to HTP of about 24 percent assuming that the Title 22 facilities are treating flow. This value is greater than the projected HSA increase in flow and results in an effective increase of about three percent from the MF/RO. Again, note that if the Title 22 facilities are not treating flow (bypassing to the sewer) the increase in mass is about 25 percent.

#### Conclusions

Based on the results of this initial study, it appears that the increase in TDS is small enough that it will not significantly affect the HTP treatment process. However, the increase may



affect operations at the West Basin facility, but we believe these will be minimal as compared to the affects of the Coastal Interceptor Sewer flow, which has much higher concentration of TDS.

For TSS and Total N with NdN, the results are consistent with the projected growth in the service area. Therefore, they will not affect HTP or West Basin operation.

The results also indicate that the increase in Total N, for the scenario without NdN, to HTP is small enough that it should not adversely affect HTP treatment process. As the regulations are likely to require NdN this may not even need to be considered.

## **Next Steps**

As mentioned within this TM, brine disposal has a number of unknowns associated with it. The IRP will recommend that more detailed and in-depth study be completed before any decisions are made concerning brine disposal. While we are assuming that the option of discharging brine to the sewer is valid for planning, this assumption must be confirmed during design of the MF/RO facilities. Regulatory and technological "triggers" must also be included in the CIP Implementation Plan to monitor changes with respect to brine.

Table 2 Summary of Potential Brine Impacts to Hyperion from Total Dissolved Solids (TDS)							
Integrated Alternatives	Year 2020 Total HSA Influent TDS	Year 2020 Total HTP Influent TDS <sup>1</sup> TDS <sup>3</sup> OF TDS		Percent TDS Capture at Upstream Facilities	Percent Increase in HTP Influent TDS	Percent Increase in HTP	Percent Increase in HSA Flow
	[lbs/day]	[lbs/day]	[mg/l]				
LC/MR	2,980,000	2,950,000	742	99.0%	32%	28%	19%
WR1a	3,040,000	2,980,000	799	98.0%	32%	23%	21%
WR1b	3,040,000	2,980,000	799	98.0%	32%	23%	21%
WR2a	2,980,000	2,930,000	779	98.3%	31%	23%	19%
WR2b	2,980,000	2,930,000	779	98.3%	31%	23%	19%
WR3a	2,980,000	2,950,000	742	99.0%	32%	28%	19%
WR3b	2,980,000	2,950,000	742	99.0%	32%	28%	19%
HA1	2,980,000	2,920,000	790	98.0%	31%	22%	19%
HA2	2,980,000	2,900,000	839	97.3%	31%	17%	19%
	-						
MD	2,980,000	2,920,000	783	98.0%	31%	23%	19%
LR1	3,390,000	3,350,000	747	98.8%	40%	36%	29%
LR2	3,050,000	3,020,000	740	99.0%	33%	30%	21%
Natasi	-		-	•		-	

Notes:

<sup>1.</sup> The current average HTP influent TDS mass is 2,011,000 lbs/day and concentration is 700 mg/l.

	Summary	of Potential Bri	Tab ne Impacts to Hy	ole 3	Total Suspen	ded Solids	(TSS)	
Integrated Alternatives	With or Without Inclusion of Title	Year 2020 Total		HTP Influent TDS'	Percent TSS Capture at Upstream Facilities	Percent Increase in HTP Influent ETS	Percent Increase in HTP Flow	Percent Increase in HSA Flow
		[lbs/day]	[lbs/day]	[mg/l]				
LC/MR	With Title 22	1,240,000	1,240,000	322	100.0%	19%	25%	19%
	Without Title 22	1,240,000	1,240,000	313	100.0%	19%	28%	19%
	1		1	1	1		ı	1
WR1a	With Title 22	1,270,000	1,260,000	354	99.2%	21%	20%	21%
	Without Title 22	1,270,000	1,270,000	340	100.0%	21%	23%	21%
WR1b	With Title 22	1,270,000	1,260,000	354	99.2%	21%	20%	21%
	Without Title 22	1,270,000	1,270,000	340	100.0%	21%	23%	21%
WR2a	With Title 22	1,240,000	1,240,000	352	100.0%	19%	18%	19%
	Without Title 22	1,240,000	1,240,000	331	100.0%	19%	23%	19%
WR2b	With Title 22	1,240,000	1,240,000	352	100.0%	19%	18%	19%
	Without Title 22	1,240,000	1,240,000	331	100.0%	19%	23%	19%
WR3a	With Title 22	1,240,000	1,240,000	353	100.0%	19%	18%	19%
	Without Title 22	1,240,000	1,240,000	313	100.0%	19%	28%	19%
WR3b	With Title 22	1,240,000	1,240,000	353	100.0%	19%	18%	19%
	Without Title 22	1,240,000	1,240,000	313	100.0%	19%	28%	19%
HA1	With Title 22	1,240,000	1,240,000	336	100.0%	19%	22%	19%
HA2	With Title 22	1,240,000	1,240,000	359	100.0%	19%	17%	19%
MD	With Title 22	1,240,000	1,240,000	343	100.0%	19%	20%	19%
	Without Title 22	1,240,000	1,240,000	333	100.0%	19%	23%	19%
LR1	With Title 22	1,420,000	1,410,000	316	99.3%	29%	36%	29%
LR2	With Title 22	1,270,000	1,270,000	321	100.0%	21%	27%	21%
L1 \ <b>L</b>	With Title 22	1,270,000	1,270,000	312	100.0%	21%	30%	21%
Notes:	William Tillo ZZ	1,210,000	1,270,000	1 0.2	100.070	_ 170	00 /0	2170

<sup>1.</sup> The current average HTP influent TSS mass is 1,005,000 lbs/day and concentration is 350 mg/l.

Table 4 Summary of Potential Brine Impacts to Hyperion from Total Nitrogen with Nitrification/Denitrification Upgrades at the **Upstream Facilities HSA Influent Total HTP Influent Total** Inclusion of Title Percent Increase Percent Increase Percent Increase Year 2020 Total With or Without Year 2020 Total in HTP Influent Percent Total in HTP Flow in HSA Flow **Alternatives** Upstream Facilities Capture at Integrated **Plants** 22 [lbs/day] [lbs/day] [mg/l] LC/MR 19% With Title 22 165,000 158,000 41 95.8% 22% 25% Without Title 22 165,000 158,000 40 95.8% 22% 28% 19% WR1a With Title 22 169,000 155,000 43 91.7% 20% 20% 21% Without Title 22 169,000 156,000 42 92.3% 21% 23% 21% WR1b With Title 22 169,000 155,000 43 91.7% 20% 20% 21% Without Title 22 169,000 156,000 42 92.3% 21% 23% 21% WR2a With Title 22 165,000 153,000 43 92.7% 19% 18% 19% 41 19% Without Title 22 165,000 155,000 93.9% 20% 23% WR2b With Title 22 165,000 153,000 43 92.7% 19% 18% 19% 23% Without Title 22 165,000 155,000 41 93.9% 20% 19% WR3a 155,000 44 93.9% 20% 18% 19% With Title 22 165,000 Without Title 22 165,000 40 22% 28% 19% 158,000 95.8% 44 WR3b 18% With Title 22 165,000 155,000 93.9% 20% 19% Without Title 22 165,000 158,000 40 95.8% 22% 28% 19% HA1 With Title 22 165,000 155,000 42 93.9% 20% 22% 19% 151,000 44 HA2 With Title 22 165,000 91.5% 18% 17% 19% MD 20% With Title 22 165,000 156,000 43 94.5% 21% 19% Without Title 22 165,000 158,000 43 95.8% 22% 23% 19% LR1 With Title 22 188,000 180,000 40 95.7% 32% 36% 29% LR2 With Title 22 169,000 162,000 41 95.9% 24% 27% 21% Without Title 22 169,000 163,000 40 96.4% 24% 30% 21% Notes:

1. The current average HTP influent Total N mass is 124,000 lbs/day and concentration is 43 mg/l.

Table 5 Summary of Potential Brine Impacts to Hyperion from Total Nitrogen without Nitrification/Denitrification Upgrades at the **Upstream Facilities HSA Influent Total HTP Influent Total** Percent Increase Inclusion of Title Percent Increase Percent Increase With or Without Year 2020 Total Year 2020 Total in HTP Influent Percent Total in HSA Flow **Alternatives** in HTP Flow ntegrated Capture at Upstream 22 Plants Facilities **Fotal N** z [lbs/day] [lbs/day] [mg/l] LC/MR 19% With Title 22 165,000 163,000 42 98.8% 24% 25% 28% Without Title 22 165,000 163,000 41 98.8% 24% 19% WR1a With Title 22 169,000 164,000 20% 21% 46 97.0% 25% Without Title 22 169,000 165,000 44 97.6% 25% 23% 21% WR1b With Title 22 169,000 164,000 46 97.0% 25% 20% 21% 165,000 44 23% Without Title 22 169,000 97.6% 25% 21% WR2a 161,000 With Title 22 165,000 46 97.6% 23% 18% 19% 162,000 23% Without Title 22 165,000 43 98.2% 24% 19% WR2b With Title 22 165,000 161,000 46 97.6% 23% 18% 19% Without Title 22 165,000 162,000 43 98.2% 24% 23% 19% WR3a With Title 22 46 23% 19% 165,000 161,000 97.6% 18% 19% Without Title 22 165,000 163,000 41 98.8% 24% 28% WR3b With Title 22 165,000 161,000 46 97.6% 23% 18% 19% Without Title 22 165,000 163,000 24% 28% 19% 41 98.8% HA1 With Title 22 165,000 161,000 44 97.6% 24% 22% 19% HA2 With Title 22 165,000 160,000 46 97.0% 23% 17% 19% MD With Title 22 165,000 161,000 45 97.6% 23% 20% 19% Without Title 22 165,000 163,000 44 98.8% 24% 23% 19% LR1 With Title 22 188,000 185,000 98.4% 36% 29% 41 33% LR2 With Title 22 169,000 167,000 42 98.8% 26% 27% 21% Without Title 22 169,000 167,000 41 98.8% 26% 30% 21% Notes:

<sup>1.</sup> The current average HTP influent Total N mass is 124,000 lbs/day and concentration is 43 mg/l.

ATTACHMENT 1	Low Cost/Min. Requirements	ŀ	ligh Be	neficial Use of	f Water R	esources	(WR)	High Adapta (HA)		More De- centralized	Low Risk (LR)
	(LCMR)		WD4	WD4L WD9	MDO	WD0 W	DOL	· · ·		(MD)	1.04 1.00
Option Wastewater Treatment	LCMR	t	WK1a	WR1b WR2a				HA1 H	IA2	MD	LR1 LR2
Tillman - Upgrade treatment (64 mgd) (Advanced Treatment)  Tillman - Upgrade and increase capacity to 80 mgd (Advanced Treatment)	64 mgd					64 mgd 64	mgd	80 mgd		64 mgd	64 mgd 64 mgd
Tillman - Upgrade and increase capacity to 100 mgd (Advanced Treatment) Tillman - Upgrade and increase capacity to 120 mgd (Advanced Treatment)			120 mgc	100 mgd	d100 mgd			120	) mgd		
Los Angeles-Glendale - Maintain existing capacity (15 mgd) (Title 22)  Los Angeles-Glendale - Increase capacity to 20 mgd (Title 22)	15 mgd	ł	20 mgd	20 mgd 20 mgc	d 20 mgd					15 mgd	15 mgd
Los Angeles-Glendale - Increase capacity to 30 mgd (Title 22)  Los Angeles-Glendale - Upgrade treatment (15 mgd) (Advanced Treatment)						30 mgd 30	mgd				15 mgd
Los Angeles-Glendale - Upgrade and increase capacity to 30 mgd (Advanced Treatment)  New Reclamation Plant - Build 10 mgd capacity near downtown (Title 22)		L		10 mgs	d 10 mgd			30 mgd 30	mgd		To mga
New Reclamation Plant - Build 30 mgd capacity in valley (Title 22)		L		To riigo		30 mgd 30	mgd				
New Reclamation Plant - Build 10 mgd capacity near downtown (Advanced Treatment)  New Reclamation Plant - Build 30 mgd capacity in valley (Advanced Treatment)										10 mgd 30 mgd	
Hyperion - Maintain existing capacity (450 mgd)  Hyperion - Increase capacity to 500 mgd	500 mgd	ŀ	450 mgc	450 mgd 450 mg	_	600 mgd500	) mgd	450 mgd450	) mgd	450 mgd	500 mgd
Hyperion - Increase capacity to 550 mgd  Terminal Island - Maintain existing capacity (30 mgd)	30 mgd	L	30 mad	30 mgd 30 mgd				30 mgd 30	mad	30 mgd	550 mgd 30 mgd 30 mgd
Wastewater Sewer System								30 Higu 30	nigu		
Build new interceptor sewer - Valley Spring Lane Interceptor Sewer  Build new interceptor sewer - Glendale Burbank Interceptor Sewer (GBIS)	X		X	X X	X	Х	X		Χ	X	X X
Build new interceptor sewer - North East Interceptor Sewer (NEIS) Phase 2  Build new interceptor sewer - for New Plant (10 mgd - 5 miles)	X	1	Х	XXX	X	Х	Χ	X	X	X	XXX
Build new interceptor sewer - for New Plant (30 mgd - 5 miles)  Build new buried storage tank - 60 MG at Tillman		ŀ				Х	X	X	X	Х	
Build new buried storage tank - 20 MG at Los-Angeles Glendale			X*	X* X*	X*	X*	X*		X*	X*	
Build new buried storage tank - 10 MG at new plant Build new buried storage tank - 20 MG at new plant				X*	X*	X* .	X*			X*	
Recycled Water (Non-Potable Demands)  Meet Los Angeles River minimum requirements using treated wastewater	X	-	Х	XX	Х	Х	Χ	X	X	X	XX
Meet Irrigation/Industry demands using treated wastewater (low/medium/high)  Recharge groundwater basin using treated wastewater	Low	Ł	High	Medium High High	High	High H	ligh	Low L	.OW	Medium	Low Low
Meet Irrigation/Industry demands using treated runoff (low/medium/high)		L	1.12 - 1-	Ŭ	Low		.ow				
Recharge groundwater basin using treated runoff  Conservation Programs			High	High High		J	ligh				
Increase conservation efforts to DWP's planned 2020 levels Increase conservation efforts further	X	ŀ	X	X X X X	X X		X X	_	X X	X X	XX
Dry Weather Urban Runoff  Local/Neighborhood Solutions		l									
Smart Irrigation	V		X	XXX	X		X	_	X	X	V V
Increase public education and participation  Regional Solutions	X		Х	XX	X	X	X	X	X	X	XXX
Diversion to Wastewater System (WW) or  Divert to Urban Runoff Plant or wetlands and Beneficially Use (URP) 1											
Divert - coastal (10 mgd)  Divert - inland (Bell Creek 2.8 mgd)	WW	L	WW	WW WW	WW		VW IRP	WW W	VW	WW	WW WW
Divert - inland (Browns Creek 3 mgd)			WW	WW	URP		IRP				WW WW
Divert - inland (Aliso Wash 1.8 mgd) Divert - inland (Wilbur Wash 1 mgd)		╁	WW	WW	URP	U	IRP				WW WW
Divert - inland (Limekiln Canyon 1.5 mgd)  Divert - inland (Caballero Canyon 1mgd)		ł	WW	WW	URP	U	IRP				WW WW
Divert - inland (Bull Creek 2.4 mgd)  Divert - inland (Tujunga Wash 6 mgd)		L	WW	WW							WW WW
Divert - inland (Pacoima Wash 7 mgd)		L									WW WW
Divert - inland (Arroyo Seco 5 mgd) Divert - inland (Reach 3 LAR 4 mgd)											WW
Divert - inland (Reach 2 LAR-12 mgd) Divert - inland (Burbank Western Channel 1.8 mgd)		1									WW WW
Divert - inland (Compton Creek 2.6 mgd)  Divert - inland (Ballona Creek 3.3 mgd)					URP URP		IRP IRP				WW
Divert - inland (Sepulveda Channel 16 mgd)		t			Orti						WW WW
Divert - inland (Dominguez Channel 16 mgd) Percent of Dry Weather Runoff Managed (of watershed - 97 mgd)	10%		30%	30% 21%	28%	21% 2	8%	21% 2°	1%	21%	100% 20%
Wet Weather Urban Runoff  Local/Neighborhood Solutions		l									
New/Redevelopment Areas - On-site treatment/discharge New/Redevelopment Areas - On-site percolation	X		X	X X X	X		X X		X	X	X X X
Retrofit Areas - Cisterns (On-site storage/use)	Α	L							<b>X</b>		A A
Residential (Low/Medium/High) Schools (Low/Medium/High)			Low	Low High Low High	High	High H	ligh ligh			High High	High
Government (Low/Medium/High) On-site percolation (infiltration trenches/basins, reduce paving/hardscape)		ł	Low	Low High	High	High H	ligh			High	High
Residential Schools			X	X X X	X		X X			X	X
Government Commercial		L	X	X X X	X	Х	X X			X	X
Rec/Cemetaries		L	X	X X	X		X			X	X
Neighborhood recharge Vacant Lots (East Valley) (Low/Medium/High)				Medium Low			.ow		ligh	Low	High
Parks/Open Space (East Valley) (Low/Medium/High) Abandoned Alleys (East Valley) (Low/Medium/High)		-		Medium Low Medium Low			.ow .ow		ligh ligh	Low Low	High High
Regional Solutions Non-urban regional recharge		Ī	Х	XX	X	Y	X				
Runoff treatment and beneficial use/discharge					\	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	V	V	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	V
Treat and benefical use/discharge (coastal area) Treat and benefical use/discharge (all areas)	Х	L	X	XX	X		X		X	X	XXX
Percent of Representative storm (1/2-inch) managed (of citywide 1,700 mgd)  Current/Anticipated Regulations Level of Compliance	10%	$oldsymbol{L}$	48%	48% 58%	58%	58% 5	8%	39% 39	9%	55%	100% 42%
California Toxics Rule  Current Total Maximum Daily Loads (TMDLs) - Bacteria (Santa Monica Bay), Trash	Yes	1	Yes	Yes Yes	Yes		'es		es /es	Yes	Yes Yes
Future Total Maximum Daily Loads (projection)	Yes No	L	Yes Partial	Yes Yes Partial Partial	Yes I Partial		es ertial	Yes Y Partial Pa	rtial	Yes Partial	Yes Yes Yes Partial
Notes: *Storage for daily (diurnal) peaks											
<sup>1</sup> Flows indicated assume no smart irrigation. Implementing smart irrigation citywide would re	educe total dry weat	the	runoff	estimates by ~1	11 mgd						
Definitions of areas of focus:  Low Cost/Minimum Requirements: alternative includes lower cost solutions or low initial in	nvestment by meeti	ina	minimu	m roquiromonto							

Low Cost/Minimum Requirements: alternative includes lower cost solutions or low initial investment by meeting minimum requirements.

High Beneficial Use of Water Resources: alternatives that include high levels of recycled water, conservation, and beneficial use of runoff that reduces use of imported water.

High Adaptability: alternatives that are most able to adjust to changing conditions, such as population, wastewater flows and regulations.

More Decentralized: alternatives with solutions based on many small-scale projects centered on small neighborhoods, households or even individuals, rather than fewer and larger regional projects. Lower Risk: alternatives that are lower in risk from a regulatory perspective (LR1) or in terms of ease of implementation from a technical, environmental and/or political and public acceptance perspective (LR2).

## ATTACHMENT #2 HSA TOTAL DISSOLVED SOLIDS MASS BALANCE

TDS Influent Concentrations (mg/L)	606	663	684	684	684
MF/RO TDS Removal	90%	90%	90%	90%	

	TWRP				LAGW	RP			New Pla	ınt 1			New Pla	nt 2			Hyperion Se	ervice Area	Hyperion	Treatment F	Plant		Compar	son to	Current	Values			
Alternative	ন্ত্ৰ Projected TWRP Influent en Flow	%gr] p TWRP Influent TDS Mass fo	sqrii  sqrii  sp. HTP  sp. HTP	grip pr TWRP Mass Discharged [K	্র Projected LAG Influent Flow ত্র for MF/RO Treatment	spp/sqqi] LAG Influent TDS Mass	od] og LAG Mass Discharged to pp HTP in Brine SA	sql]  Vab   CAG Mass Discharged  Kab   CAG Mass Discharged	☑ New Plant 1 Influent Flow ☐ for MF/RO Treatment	ଜ୍ମ New Plant 1 Influent TDS pp Mass K	orll New Plant 1 Mass Discharged to HTP in Brine	ogl] po New Plant 1 Mass Discharged	ন New Plant 2 Influent Flow টু for MF/RO Treatment	াল জ New Plant 2 Influent TDS p Mass	Kr  or   or  New Plant 2 Mass   Discharged to HTP in Brine	[Ār  squires  Mass  Apple   Discharged	g Projected 2020 HSA Flow	HSA TDS Mass	state   Mass Removed From System   Sys	sopi   Sopi Mass to HTP   Sopial Mass to HTP	글 © Estimated 2020 Flow at HTP	를 Estimated 2020 Influent [구 Concetration at HTP	[bgm] Current HSA Flow	a Current HTP Flow	தி Current HTP Influent ௺Concentration	or Current Average Influent Py Mass	Increase in TDS mass	Increase in HTP Flow Increase in HSA Flow	_
LC/MR	64	323,778	291,400	32,378	0	0	0	0	0	0	0	0	0	0	0	0	521	2,975,049	32,378	2,942,671	475	742	420	344	700	2,010,749	32%	28% 19%	0
WR1a WR1b WR2a WR2b WR3a WR3b	120 120 100 100 64	607,084 607,084 505,903 505,903 323,778 323,778	546,375 546,375 455,313 455,313 291,400 291,400	60,708 60,708 50,590 50,590 32,378 32,378	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	0 0 0 0 0	532 532 521 521 521 521 521	3,037,862 3,037,862 2,975,049 2,975,049 2,975,049 2,975,049	60,708 60,708 50,590 50,590 32,378 32,378	2,977,153 2,977,153 2,924,458 2,924,458 2,942,671 2,942,671	446 450	799 799 779 779 779 742 742	420 420 420 420	344 344 344 344 344 344	700 700 700 700 700 700 700	2,010,749 2,010,749 2,010,749 2,010,749 2,010,749 2,010,749	32% 32% 31% 31% 32% 32%	23% 21% 23% 21% 23% 19% 23% 19% 28% 19% 28% 19%	)
HA1 HA2			364,250 546,375		30 30	166,026 166,026		16,603 16,603	0 0	0	0	0 0	0	0	0	0	521 521	2,975,049 2,975,049	57,075 77,311	2,917,974 2,897,738	442 414	790 839	420 420	344 344	700 700	2,010,749 2,010,749		22% 19% 17% 19%	)
MD	64	323,778	291,400	32,378	0	0	0	0	30	######	154,177	17,131	10	57,10	3 51,39	2 5,710	521	2,975,049	55,219	2,919,830	447	783	420	344	700	2,010,749	31%	23% 19%	)
LR1 LR2	64		291,400 291,400		15 0	83,013 0	74,712 0	8,301 0	0 0	0	0	0	0	0	0	0	593 534	3,386,188 3,049,282	40,679 32,378	3,345,509 3,016,904		747 740	420 420	344 344	700 700	2,010,749 2,010,749		36% 29% 30% 21%	) ) ,

11/24/2003 03 10-22\_IRP Mass Balance with Brine to Sewer.xls

Assumptions:

1. Concentrations of Influent TDS based on Wisard download from year 2020 Projections from Jan-02 to Aug-03. It is assumed that the influent concentrations will not change in 2020.

2. The pecent removal by the RO membranes is of the total influent TSS Mass

## **ATTACHMENT #3** HSA TOTAL SUSPENDED SOLIDS MASS BALANCE

TSS (mg/L) Concentrations Tertiary TSS Removal	250	420	286	286	286
Assumption	94%	96%	96%	96%	
MF/RO TSS Removal Assumption	99%	99%	99%	99%	

	TV	/RP					LAGWR	₽.				New Plant	<u>:</u> 1				New Plan	nt 2				Hyperion Se	rvice Area
Alternative		© Projected TWRP Influent Flow ≣	sopposed TWRP Influent TSS Mass	লু TWRP TSS Mass Discharged b to HTP from WAS only (Title বৈ 22)	TWRP TSS Mass Discharged pt to HTP from WAS and WF/RO	ysqr] by TWRP TSS Mass Discharged [K	ਤ © Projected LAG Influent Flow	sop LAG Influent TSS Mass	GE LAG TSS Mass Discharged p to HTP from WAS only (Title 조 22)	GI LAG TSS Mass Discharged pp to HTP from WAS and K MF/RO	sp.  sp.  sp.  sp.  sp.  sp.  sp.  sp.	ଅ © New Plant 1 Influent Flow	ogil pp/som Plant 1 Influent TDS [k Mass	GNew Plant 1 TSS Mass Discharged to HTP from WAS only (Title 22)	ল New Plant 1 TSS Mass © Discharged to HTP from K WAS and MF/RO	New Plant 1 Mass   Discharged   Discharged	ଇ ଓ © New Plant 2 Influent Flow	ଜା] py New Plant 2 Influent TSS Kass	ଜି New Plant 2 TSS Mass ର Discharged to HTP from & WAS only (Title 22)	or New Plant 2 TSS Mass Discharged to HTP from WAS and MF/RO	90] New Plant 2 Mass Discharged	교원 D Projected 2020 HSA Flow 크	HSA TSS Mass
LC/MR	A		133,526		132,191	1,335		15 52,576 0 0			2,103	0	0			0	. <b></b>	0 (	)	0	0	521 521	1,243,515
	В	04	133,526		132,191	1,335		0 0	0				0				·	0 (	J	<u>U</u>	U	521	1,243,515
WR1a	Δ	120	250,362		247,858	2,504		20 70,101	67,297		2,804	0	0				. <b></b>	0 (		 N	0	532	1,269,769
			250,362		247,858	2,504	<del></del>	0 0			2,004	0	<u>_</u>			0		<u> </u>	<u></u>	<u> </u>	<u>-</u>	532	1,269,769
WR1b	A		250,362		247,858	2.504		20 70,101			2.804	0				0		0 (	0	0	0	532	1,269,769
	В		250,362		247,858	2,504		0 0	0		0	0	0			0						532	1,269,769
WR2a	Α		208,635		206,549	2,086		20 70,101	67,297		2,804	10	23,868	22,913		955		0 (	0	0	0	521	1,243,515
	В	100	208,635		206,549	2,086		0 0	0		0	0	0	0		0						521	1,243,515
WR2b	Α	100	208,635		206,549	2,086		20 70,101	67,297		2,804	10	23,868	22,913		955		0 (	0	0	0	521	1,243,515
	В		208,635		206,549	2,086		0 0			0	0				0						521	1,243,515
WR3a	Α		133,526		132,191	1,335		30 105,152	100,946		4,206	30	71,604	68,739		2,864		0 (	0	0	0	521	1,243,515
	В	64	133,526		132,191	1,335		0 0			0	0	0	0		0						521	1,243,515
WR3b	A		133,526		132,191	1,335	;	30 105,152	100,946		4,206	30	71,604	68,739		2,864		0 (	0	0	0	521	1,243,515
	В	64	133,526		132,191	1,335		0 0	0		0	0	0	0		0						521	1,243,515
HA1	A		166,908		165,239	1,669		30 105,152		104,101	1,052	0	<u>_</u>		0	0		0 (	0	0	0	521	1,243,515
HA2	A	120	250,362		247,858	2,504		30 105,152		104,101	1,052	0	0			0		0 (	0	0	0	521	1,243,515
MD	A	64	133,526		132,191	1,335		15 52,576			2,103	30	71,604		70,887	716	1	0 23,86	8	23,629	239	521	1,243,515
	В	64	133,526		132,191	1,335		0 0	0		0											521	1,243,515
								7=															
LR1	<u>A</u>		133,526		132,191	1,335		15 52,576		52,050	526	0	<u>-</u>			0		0 (	<u>)                                    </u>	0	0	593	1,415,363
LR2	<u>A</u>		133,526		132,191	1,335		15 52,576			2,103	0	<u>-</u>			0		0 (	<u>)</u>	<u>U</u>	0	534	1,274,543
	В	64	133,526		132,191	1,335		0 0	0		0	0	0			0		0 (	J	0	0	534	1,274,543

Case A = with Title 22 Plants Operating Case B = with Title 22 Plants Bypassing to Sewer

- Concentrations of Influent TSS based on year 2020 Projections from Section 4.4 in the Wastewater Management Volume.
   TSS Title 22 removal efficiency is based on the percent difference between the influent concentration and the design effluent value of 15 mg/L.
   The pecent removal by the RO membranes is of the total influent TSS Mass

03 10-22\_IRP Mass Balance with Brine to Sewer.xls 11/24/2003

TSS (mg/L)
Concentrations
Tertiary TSS Removal
Assumption
MF/RO TSS Removal
Assumption

		Hyperion	Treatment	Plant		Comparis	on to Curre	nt Values				
Alternative		Total Mass Removed From System	op Po Total Mass to HTP	Estimated 2020 Flow at HTP	Estimated 2020 Influent Concetration at HTP	Current Average HSA Flow	Current Average HTP Flow	Historical Influent Concentration at HTP	Current Total Mass to HTP	Percent Increase in Total TSS Mass	Percent Incease in HSA Flow	Percent Increase in Influent Flow at HTP
		[lbs/day]	[IDS/Gay]	[mgd]	[mg/L]	[mgd]	[mgd]	[mg/L]	[lbs/day]			
LC/MR	Α	3,438	3 1,240,076	461	322	 420	344	350	1,004,786	19.0%	19.4%	25%
	В	1,335	1,242,179	475	313	 420	344	350	1,004,786	19.1%	19.4%	28%
WR1a	A	5,308	3 1,264,462	428	354	 420	344	350	1,004,786	20.5%	21.1%	20%
VVICIA	B	2,504		446		 420	344	350	1.004,786	20.7%	21.1%	23%
WR1b	A	5.308		428		 420	344	350	1.004.786	20.5%	21.1%	20%
	В	2.504		446		 420	344	350	1.004.786	20.7%	21.1%	23%
WR2a	A	5,845	1,237,670	421	352	 420	344	350	1,004,786	18.8%	19.4%	18%
	В	2,086		450		420	344	350	1,004,786	19.1%	19.4%	23%
WR2b	Α	5,845	1,237,670	421	352	 420	344	350	1,004,786	18.8%	19.4%	18%
	В	2,086	3 1,241,428	450		 420	344	350	1,004,786	19.1%	19.4%	23%
WR3a	Α	8,405	1,235,109	419	353	 420	344	350	1,004,786	18.6%	19.4%	18%
	В	1,335	1,242,179	475	313	420	344	350	1,004,786	19.1%	19.4%	28%
WR3b	Α	8,405	1,235,109	419	353	420	344	350		18.6%	19.4%	18%
	В	1,335	1,242,179	475	313	 420	344	350	1,004,786	19.1%	19.4%	28%
HA1	A	2.721	1.240.794	442	336	 420	344	350	1,004,786	19.0%	19.4%	22%
HA2	A		1,239,960	414		 420	344		1,004,786	19.0%	19.4%	17%
<u></u>		0,000	.,,			 			.,,,,,,,,,			
MD	Α	4,393	3 1,239,122	433	343	 420	344	350	1,004,786	18.9%	19.4%	20%
	В	<del></del>	1,242,179	447		 420	344	350		19.1%	19.4%	23%
		1.861	1 4 442 500	E07	240	 400	244	350	1.004.786	20.00/	20.20/	260/
LR1	A			537		 420	344			28.9%	29.2%	36%
LR2	A		1,271,105	474		 420	344 344	350		21.0%	21.3%	27%
	В	1,335	1,273,208	488	312	 420	344	350	1,004,786	21.1%	21.3%	30%

Case A = with Title 22
Plants Operating
Case B = with Title 22
Plants Bypassing to
Sewer

11/24/2003 03 10-22\_IRP Mass Balance with Brine to Sewer.xls

### **ATTACHMENT #4** HSA TOTAL NITROGEN MASS BALANCE ASSUMING NDN UPGRADES

Total N (mg/L) Concentrations	40	46	38	38	38
NdN Percentage of Total N Removed	75%	78%	74%	74%	
NdN Percentage of N in Waste TSS	7%	7%	7%	7%	
MF/RO Total N Removal Assumption	90%	90%	90%	90%	

	TWRP					LAGWRP					New Plan	:1				New Plan	nt 2				Hyperion Serv	vice Area
Alternative	글 B Projected TWRP Influent Flow	spaint   spain   spai	spiral Nass   Semoved by NdN	WRP Mass to Waste   Sludge	pysqui] TWRP Mass to Brine [K	a pp Projected LAG Influent Flow	   LAG Influent Total N   Mass   Mass	LAG Total N Mass   Removed by NdN	LAG Mass to Waste   Sludge 	[kep/sqg] [AG Mass to Brine	교 B New Plant 1 Influent Flow	% New Plant 1 Influent Sp. Total N Mass	Vew Plant 1 Total N Pas Removed by NdN	oke Plant 1 Mass to Waste Sludge	wepløgl New Plant 1 Mass to Krine [kass to	B B New Plant 2 Influent Flow	ogi] New Plant 2 Influent Total N Mass	ogi] Some Plant 2 Total N Sp Mass Removed by NdN	ogi] New Plant 2 Mass to Waste Sludge [A	Sew Plant 2 Mass to   Serine   Serine	abba Projected 2020 HSA Flow	solution   Sected HSA Total  Solution   Sected HSA Total  N Mass
LC/MR	A 64 B 64				4,807 4,807	15 0	5,758 0	4,507 0	3,689 0	<del>-</del>	C	0	0	0	0	<del></del>	0	0 (	0 0	0 0	521 521	165,222 165,222
WR1a	A 120 B 120		. <b></b> .	18,401 18,401	9,013 9,013	20	7,678 0	6,009 0	4,919 0		<u>C</u>	0	0	0	0		0	0 0	0 (	) 0 ) 0	532 532	
WR1b	A 120	40,058	30,043	18,401 18,401	9,013 9,013	20	7,678 0	6,009 0	4,919 0		C	0	0	0	0		0	0 0	0 (	0	532 532	
WR2a	A 100 B 100	33,382	25,036	15,334 15,334	7,511 7,511	20	7,678 0	6,009 0	4,919 0	<del></del>	10		2,337 0	1,917 0	751 0		0	0	0 0	) 0	521	165 222
WR2b	A 100 B 100	33,382	25,036	15,334 15,334	7,511 7,511	20	7,678 0	6,009 0	4,919 0	1,502	10		2,337	1,917 0	751 0		0	0	0 0	) 0	521 521 521 521	165,222 165,222
WR3a	A 64	21,364	<u></u> _	9,814 9,814	4,807 4,807	30	11,517 0	9,013 0	7,378	<del>-</del>	30	9,514 0	7,010 0	5,750 0	2,253 0		0	0	0 0	) 0	521 521	165,222 165,222
WR3b	A 64 B 64	21,364	16,023 16,023	9,814 9,814	4,807 4,807	30 0	11,517 0	9,013 0	7,378 0	2,253 0	30 0	9,514 0	7,010 0	5,750 0	2,253 0		0	0 0	0 C	) 0 ) 0	521 521 521	165,222 165,222 165,222
HA1 HA2	A 80 A 120	26,705 40,058	<del></del>		6,009 9,013	30 30	11,517 11,517	9,013 9,013	7,378 7,378		C		0 0		0		0	0 (	0 <u>(</u>	0 0	521 521	165,222 165,222
MD	A 64 B 64			9,814 9,814	4,807 4,807	15 0	5,758 0	4,507 0	3,689 0		30	9,514 0	7,010 0		2,253 0	1	0 3,17	1 2,33°	7 1,917 0 0	7 751 ) 0	521 521	165,222 165,222
LR1 LR2	A 64 A 64	21,364			4,807 4,807	15 15	5,758 5,758	4,507 4,507	3,689 3,689	1,127 1,127	0	0	0	0	0	<del></del>	0	0 (	0 0	0 0	593 534	
LRZ	B 64		16,023	9,814	4,807	0	0,756	4,507	0,009	0	<u>C</u>	0	0	0	0		0	0	0 (	) 0	534	169,345

Case A = with Title 22 Plants Operating Case B = with Title 22 Plants Bypassing to Sewer

- Concentrations of Influent Total N based on year 2020 Projections from Section 4.4 in the Wastewater Management Volume.
   NdN removal efficiency is based on the percent difference between the influent concentration and the design effluent value of 10 mg/L.
   Mass of Nitrogen as a percentage of mass of TSS is based on studies for other NdN plants, where the nitrogen was about 8% of the total VSS mass. This also assumes a VSS to TSS ratio of 0.87.
- 4. The pecent removal by the RO membranes is of the remaining mass of nitrogen, which is not removed by the NdN

Total N (mg/L)
Concentrations
NdN Percentage of Total N
Removed
NdN Percentage of N in
Waste TSS
MF/RO Total N Removal
Assumption

		Hyperion Tre	eatment F	Plant	Compariso	on to Curre	nt Values				
Alternative		[kep/sql] [Arp	ලි Estimated 2020 Flow at HTP	표 Estimated 2020 다 Influent Concetration at HTP	ସ ଘ Current Average HSA E Flow	글 E Current Average HTP Flow	교 © Historical Influent Concentration at HTP	oqui Surrent Total Mass to See HTP	Percent Increase in Total N Mass	Percent Incease in HSA Flow	Percent Increase in Influent Flow at HTP
LC/MR		157 526	461	41	 420	244	42	100 445	24.60/	10.40/	250/
LC/MR	A B	157,536 158,479	461 475	41 40	 420 420	344 344	43 43	123,445 123,445	21.6% 22.1%	19.4% 19.4%	25% 28%
	ь	130,479	4/3	40	 420	344	43	123,443	22.170	19.470	20 70
WR1a	A	154,810	428	43	 420	344	43	123,445	20.3%	21.1%	20%
WKIa	В	156,067	446	42	 420	344	43	123,445	20.9%	21.1%	23%
WR1b	A	154,810	428	43	 420	344	43	123,445	20.3%	21.1%	20%
VVICIO	В	156.067	446	42	 420	344	43	123,445	20.9%	21.1%	23%
WR2a	A	152.925	421	43	 420	344	43	123,445	19.3%	19.4%	18%
	В	154.686	450	41	 420	344	43	123,445	20.2%	19.4%	23%
WR2b	A	152,925	421	43	 420	344	43	123,445	19.3%	19.4%	18%
	В	154,686	450	41	 420	344	43	123,445	20.2%	19.4%	23%
WR3a	A	155,083	419	44	 420	344	43	123,445	20.4%	19.4%	18%
	В	158,479	475	40	 420	344	43	123,445	22.1%	19.4%	28%
WR3b	A	155,083	419	44	 420	344	43	123,445	20.4%	19.4%	18%
	В	158.479	475	40	 420	344	43	123.445	22.1%	19.4%	28%
HA1	Α	154,907	442	42	 420	344	43	123,445	20.3%	19.4%	22%
HA2	Α	150,693	414	44	 420	344	43	123,445	18.1%	19.4%	17%
MD	Α	155,522	433	43	 420	344	43	123,445	20.6%	19.4%	20%
	В	158,479	447	43	 420	344	43	123,445	22.1%	19.4%	23%
LR1	Α	180,369	537	40	 420	344	43	123,445	31.6%	29.2%	36%
LR2	Α	161,659	474	41	 420	344	43	123,445	23.6%	21.3%	27%
	В	162,601	488	40	 420	344	43	123,445	24.1%	21.3%	30%

Case A = with Title 22 Plants Operating Case B = with Title 22 Plants Bypassing to Sewer

11/24/2003 03 10-22\_IRP Mass Balance with Brine to Sewer.xls

# ATTACHMENT #5 HSA TOTAL NITROGEN MASS BALANCE ASSUMING NO NDN UPGRADES

Total N (mg/L) Concentrations	40	46	38	38	38
MF/RO Total N Removal	90%	90%	90%	90%	

Part   Part	
WR1a         A         120         40,058         36,052         20         7,678         6,910         0         0         0         0         0         0         0         0         521         165,222         163,086         475         41         420         344         43         123,445         24.3%         19           WR1a         A         120         40,058         36,052         20         7,678         6,910         0         0         0         0         532         168,711         163,937         428         46         420         344         43         123,445         24.7%         21.           WR1b         A         120         40,058         36,052         20         7,678         6,910         0         0         0         0         532         168,711         163,937         428         46         420         344         43         123,445         24.7%         21.           WR1b         A         120         40,058         36,052         20         7,678         6,910         0         0         0         0         532         168,711         164,705         446         44         420         344	Flow Percent Increase in Influent Flow at HTP
WR1a         A         120         40,058         36,052         20         7,678         6,910         0 <th></th>	
WR1a         A         120         40,058         36,052         20         7,678         6,910         0         0         0         0         0         532         168,711         163,937         428         46         420         344         43         123,445         24.7%         21.           WR1b         A         120         40,058         36,052         20         7,678         6,910         0         0         0         0         0         532         168,711         164,705         446         420         344         43         123,445         24.7%         21.           WR1b         A         120         40,058         36,052         20         7,678         6,910         0         0         0         0         532         168,711         163,937         428         46         420         344         43         123,445         24.7%         21.           WR2a         A         100         33,382         30,043         20         7,678         6,910         10         3,171         2,854         0         0         0         521         165,222         160,799         421         46         420         344         43	
WR1a A 120 40,058 36,052 20 7,678 6,910 0 0 0 0 0 0 0 532 168,711 163,937 428 46 420 344 43 123,445 24.7% 21.    WR1b A 120 40,058 36,052 20 7,678 6,910 0 0 0 0 0 0 532 168,711 164,705 446 44 420 344 43 123,445 25.1% 21.   WR2a A 100 33,382 30,043 20 7,678 6,910 10 3,171 2,854 0 0 0 521 165,222 160,799 421 46 420 344 43 123,445 23.2% 19.   WR2b A 100 33,382 30,043 20 7,678 6,910 10 3,171 2,854 0 0 0 521 165,222 160,799 421 46 420 344 43 123,445 23.2% 19.   WR2b A 100 33,382 30,043 20 7,678 6,910 10 3,171 2,854 0 0 0 521 165,222 160,799 421 46 420 344 43 123,445 23.2% 19.   WR2b A 100 33,382 30,043 20 7,678 6,910 10 3,171 2,854 0 0 0 521 165,222 160,799 421 46 420 344 43 123,445 23.2% 19.   WR2b A 100 33,382 30,043 0 0 0 0 0 0 0 0 0 0 0 521 165,222 160,799 421 46 420 344 43 123,445 23.2% 19.   WR2b A 100 33,382 30,043 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4% 20%
B       120       40,058       36,052       0       <	.1% 20%
WR1b     A     120     40,058     36,052     20     7,678     6,910     0	
WR2a     A     100     33,382     30,043     20     7,678     6,910     10     3,171     2,854     0     0     0     521     165,222     160,799     421     46     420     344     43     123,445     23.2%     19       B     100     33,382     30,043     0     0     0     0     0     0     521     165,222     161,884     450     43     420     344     43     123,445     23.7%     19       WR2b     A     100     33,382     30,043     20     7,678     6,910     10     3,171     2,854     0     0     521     165,222     160,799     421     46     420     344     43     123,445     23.2%     19       B     100     33,382     30,043     0     0     0     0     0     521     165,222     160,799     421     46     420     344     43     123,445     23.7%     19       B     100     33,382     30,043     0     0     0     0     0     521     165,222     161,884     450     43     420     344     43     123,445     23.7%     19       WR3a     A     64 </td <td></td>	
WR2a     A     100     33,382     30,043     20     7,678     6,910     10     3,171     2,854     0     0     0     521     165,222     160,799     421     46     420     344     43     123,445     23.2%     19       B     100     33,382     30,043     0     0     0     0     0     0     521     165,222     161,884     450     43     420     344     43     123,445     23.7%     19       WR2b     A     100     33,382     30,043     20     7,678     6,910     10     3,171     2,854     0     0     521     165,222     160,799     421     46     420     344     43     123,445     23.2%     19       B     100     33,382     30,043     0     0     0     0     0     521     165,222     160,799     421     46     420     344     43     123,445     23.7%     19       B     100     33,382     30,043     0     0     0     0     0     521     165,222     161,884     450     43     420     344     43     123,445     23.7%     19       WR3a     A     64 </td <td></td>	
WR2b         A         100         33,382         30,043         20         7,678         6,910         10         3,171         2,854         0         0         0         521         165,222         160,799         421         46         420         344         43         123,445         23.2%         19           B         100         33,382         30,043         0         0         0         0         0         521         165,222         161,884         450         43         420         344         43         123,445         23.7%         19           WR3a         A         64         21,364         19,228         30         11,517         10,365         30         9,514         8,562         0         0         521         165,222         160,983         419         46         420         344         43         123,445         23.3%         19	
B 100 33,382 30,043 0 0 0 0 0 0 0 0 0 0 0 0 0 0 165,222 161,884 450 43 420 344 43 123,445 23.7% 19 WR3a A 64 21,364 19,228 30 11,517 10,365 30 9,514 8,562 0 0 0 521 165,222 160,983 419 46 420 344 43 123,445 23.3% 19	
WR3a A 64 21,364 19,228 30 11,517 10,365 30 9,514 8,562 0 0 0 0 521 165,222 160,983 419 46 420 344 43 123,445 23.3% 19	
WR3a A 04 21,304 19,226 30 11,517 10,305 30 9,514 6,302 0 0 0 521 105,222 100,985 419 40 420 344 43 125,445 25.3% 19  B 64 21,364 19,228 0 0 0 0 0 0 521 165,222 163,086 475 41 420 344 43 123,445 24,3% 10	
WR3b A 64 21,364 19,228 30 11,517 10,365 30 9,514 8,562 0 0 0 0 521 165,222 160,983 419 46 420 344 43 123,445 23.3% 19	
B 64 21,364 19,228 0 0 0 0 0 0 0 0 0 521 165,222 163,086 475 41 420 344 43 123,445 24.3% 19.	
HA1 A 80 26,705 24,035 30 11,517 10,365 0 0 0 0 0 521 165,222 161,400 442 44 420 344 43 123,445 23.5% 19.	.4% 22%
HA2 A 120 40,058 36,052 30 11,517 10,365 0 0 0 0 0 521 165,222 160,065 414 46 420 344 43 123,445 22.9% 19.	.4% 17%
MD A 64 21,364 19,228 15 5,758 5,182 30 9,514 8,562 10 3,171 2,854 521 165,222 161,241 433 45 420 344 43 123,445 23.4% 19.	
B 64 21,364 19,228 0 0 0 0 0 0 0 0 521 165,222 163,086 447 44 420 344 43 123,445 24.3% 19.	.4% 23%
LR1 A 64 21,364 19,228 15 5,758 5,182 0 0 0 0 0 593 188,055 185,343 537 41 420 344 43 123,445 33.4% 29.	.2% 36%
LR1 A 64 21,364 19,228 15 5,758 5,182 0 0 0 0 0 593 188,055 185,343 537 41 420 344 43 123,445 33.4% 29  LR2 A 64 21,364 19,228 15 5,758 5,182 0 0 0 0 0 534 169,345 166,633 474 42 420 344 43 123,445 25.9% 21	
LR2 A 64 21,364 19,228 15 5,758 5,182 0 0 0 0 0 534 169,345 166,633 474 42 420 344 43 123,445 25.9% 21.  B 64 21,364 19,228 0 0 0 0 0 0 0 534 169,345 167,208 488 41 420 344 43 123,445 26.2% 21.	

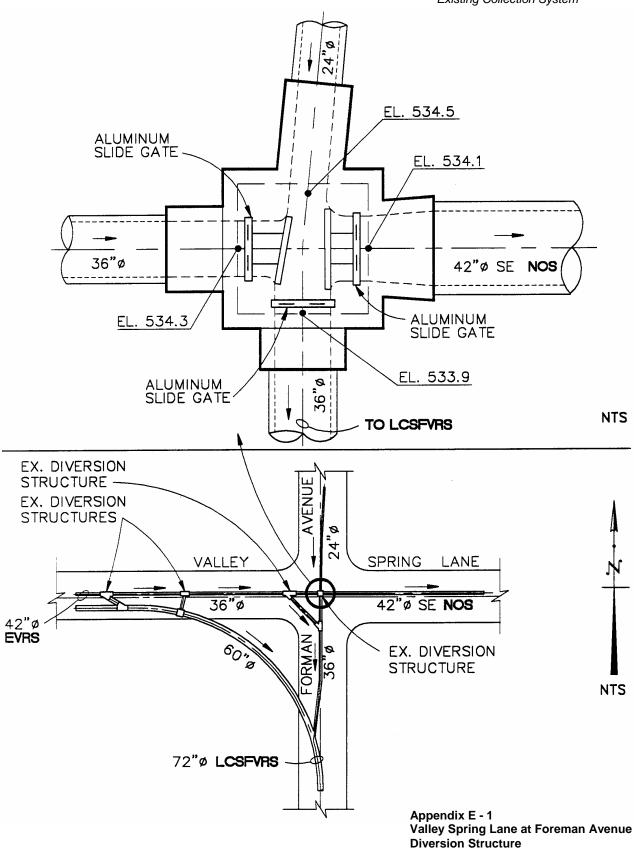
Case A = with Title 22 Plants Operating Case B = with Title 22 Plants Bypassing to Sewer

#### Assumptions

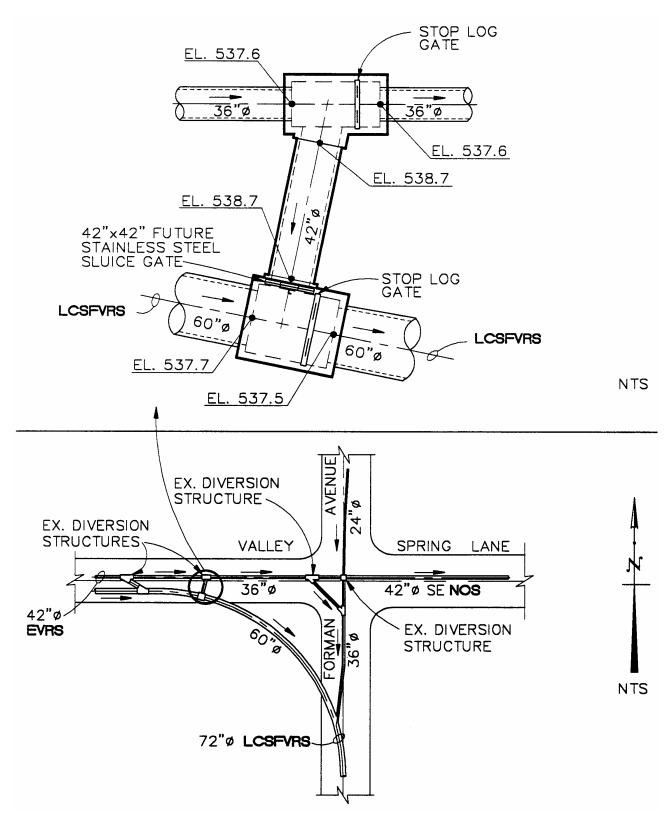
11/24/2003 03 10-22\_IRP Mass Balance with Brine to Sewer.xls

<sup>1.</sup> Concentrations of Influent Total N based on year 2020 Projections from Section 4.4 in the Wastewater Management Volume.

# Appendix F Key Diversion Structures

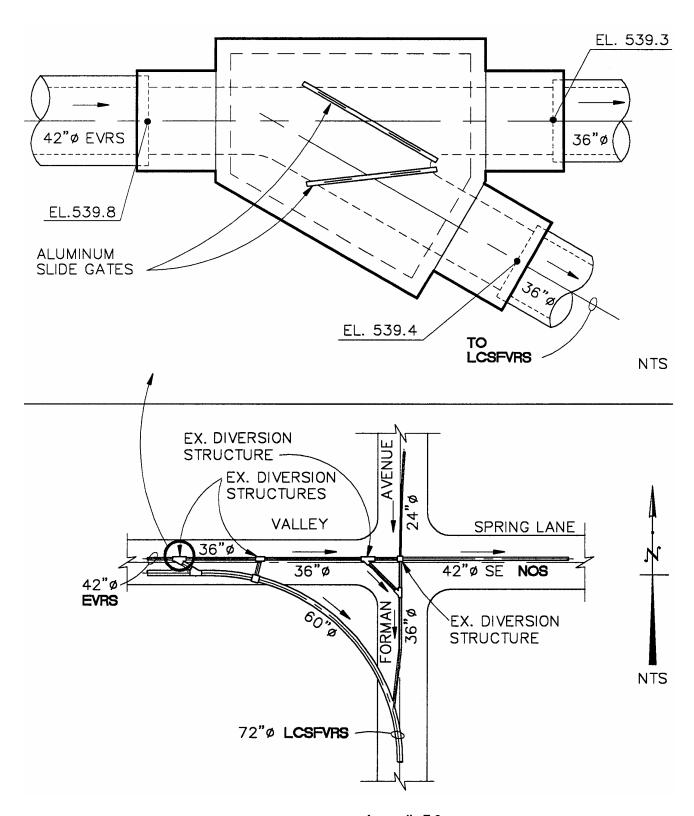






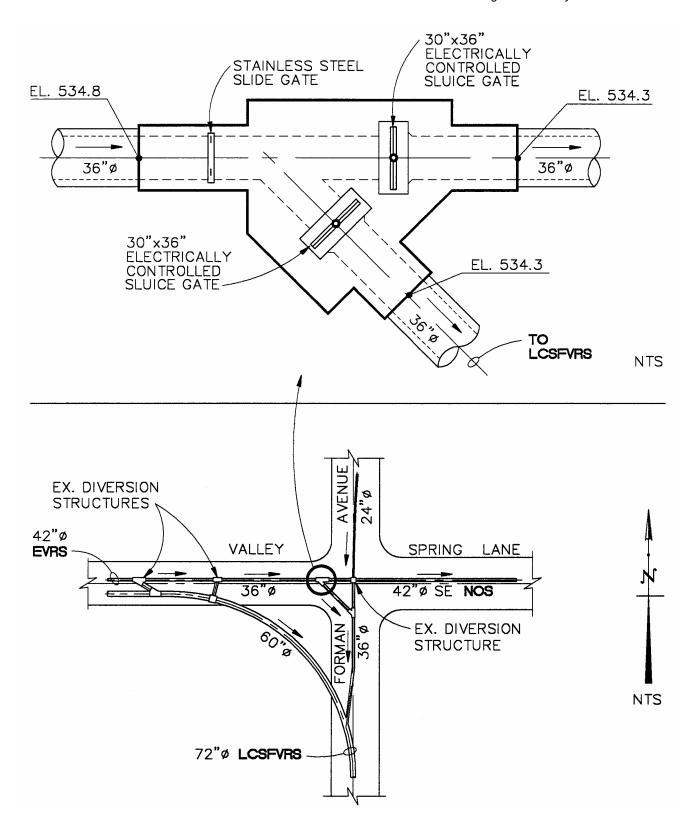
Appendix E - 2 150' West of Valley Spring Lane at Foreman Avenue Diversion Structure

CH:CDM



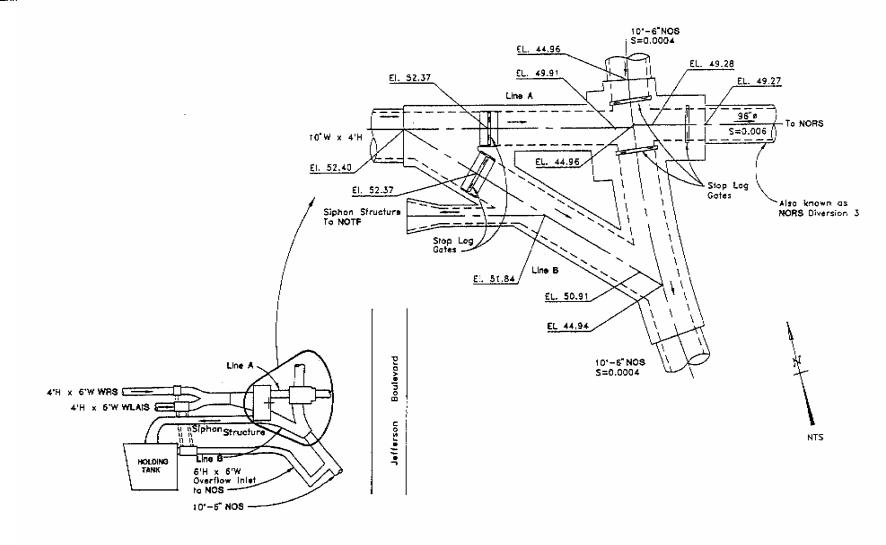
Appendix E-3 240' West of Valley Spring Lane at Forman Avenue Diversion Structure





Appendix E - 4
West of Valley Spring Lane at Forman Avenue
Diversion Structure





Appendix E - 5 North Outfall Treatment Facility Diversion Structure



Appendix G Summary of Wastewater Collection System Programs

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# SECTION 1.0 INTRODUCTION

The City of Los Angeles (City) is the largest City in California. The City encompasses an area of approximately 465 square miles, of which there are approximately 150 square miles of hills and mountains and 22 square miles of parklands. According to the 2000 census, the City has a current population of 3.7 million. The City occupies the central portion of the Los Angeles Basin. It is surrounded by San Gabriel, Santa Susanna, and Verdugo Mountains on the north; incorporated cities on the east; Pacific Ocean on the south and southwest, and unincorporated portions of Los Angeles County and Malibu on the west.

The City operates and maintains one of the largest wastewater collection systems in the nation, serving over 4 million people within a 550 square mile service area. The City's collection system consists of: more than 6,500 miles of sewers; 140,000 maintenance holes; and 46 sewage-pumping plants. In addition, the City's system serves more than 600,000 private properties within the City An estimate 11,000 miles of private building sewers connect the building plumbing to the City owned and maintained sewer mains. The City also provides conveyance and waste treatment under contract with 27 "contract agencies." These agencies provide sewer service to approximately 150,000 private properties. They own and maintain their own collection systems. Land use in Los Angeles is diverse, with large areas of residential, commercial, and industrial development. Development ranges from the densely populated central city to the quiet, secluded areas of the Santa Monica Mountains.

The City's system needs include:

- Upgrading and renewing the City's aging sewer system.
- Upgrading the sewer system to mitigate wet weather spills (similar to those that occurred in 1998).¹ The City's wastewater system improvements since 1989 enabled its system, as a whole, to perform very well during these unique and extraordinary wet weather conditions.
- Minimizing the number of dry weather overflows and backups caused by sewer blockages<sup>2</sup>.
- Addressing the sewer odor and corrosion problems in the sewer system.

To address these needs, the City has implemented:

- An effective system condition assessment and planning program.
- An extensive system upgrade (capital improvement program).
- Ongoing preventive and proactive system maintenance program.

This report summarizes current and future City programs, which addresses the City's needs and implementation towards eliminating sewer overflows.

<sup>&</sup>lt;sup>1</sup> During the unique and extraordinary 1998 El Niño season, the total volume of sewage that overflowed was 40 million gallons. This constituted less than 0.08% of the urban runoff in the channels. With all that extraordinary volume of overflows, the City's sewer system safely conveyed 99.98 percent of the yearly flow. <sup>2</sup> The sewer system safely conveys approximately182 billion gallons of sewage annually to the treatment or water reclamation plants. The total volume of dry weather overflows experienced in FY 1999/00 is less than 0.00045 percent of the yearly flow, which equates to less than two minutes of the yearly flow. Typically, the total volume of overflows is very small with most of the flow being captured and returned back to the sewer system. In August 2000, a total of 10,247 gallons overflowed out of the sewer system. The majority of the overflows were captured with only 2,500 gallons reaching the receiving waters. The amount that reached the receiving waters equates to less than 0.000016 percent of the flow conveyed in August 2000 (99.99998 percent conveyance efficiency).

# Section 2.0 Current Programs

### 2.1 Sewer Infiltration and Inflow Prevention (SIIP)

Like all cities, Los Angeles has a storm drain system for rainwater to prevent flooding and a sewer system for collection and treatment of wastewater. In Los Angeles the two systems are separate, which allows the sewer system to be much smaller since it does not have to handle the peak flow of storm water runoff. The intent is to keep the two systems separate although over the years a small number of private property storm drains have been connected to the sanitary sewer system thereby contributing stormwater to the sanitary sewer system. This stormwater inflow adds to the volume of water that sewer pipes must convey during rain storms. Rainfall also enters the sewers through the maintenance hole covers, cracks and breaks in the sewer pipes and other miscellaneous sources. These connections and defects are sources of unwanted water that enters the sewer system. This extraneous water is called Infiltration/Inflow (I/I). Los Angeles sewers are normally designed to operate so the peak dry weather flow only fills up about half of the sewer pipe. The remaining half of the pipe is reserved for I/I during rainstorms.

In 1998, El Nino rainstorms flooded the City's sewer system causing sewer overflows. Sewer overflows are a major concern to the City and regulatory agencies because of the adverse impact they have on public health and safety. The El Nino spills resulted in legal action against the City from the Los Angeles Regional Water Quality Control Board (LARWQCB), the Environmental Protection Agency (EPA) and other private parties to take specific actions to decrease the risk of future overflows. It is the City's desire to eliminate all avoidable wet weather overflows by taking every step possible to minimize future risk of spills during rainstorms and the City is implementing various programs to both increase the sewer capacity and to reduce sources of I/I. One of the programs is called Sewer Infiltration/Inflow Prevention (SIIP).

SIIP is a new program to reduce the sources of I/I. I/I sources include storm drains, roof drains, open cleanouts, cracked and broken sewers, leaking maintenance hole covers and other miscellaneous defects. The City is taking steps to reduce I/I from these various sources as follows:

- Inspecting and repairing sewers for broken and cracked sewer pipes.
- Installing inner covers in maintenance holes to limit the entry of runoff into sewers in areas with high runoff.
- Plugging maintenance hole cover openings in streets and intersections prone to flooding during rain storms.
- Inspecting properties that may have storm drain connections to the sewers and taking corrective action to disconnect them from the sewer and connect them to the storm drain system.

Through its condition assessment program, the City identified 406 storm drain connections from private properties, mainly roof drains, area drains, parking lot drains, and downspouts. On June 12, 2001 the City Council approved a motion, Council File 01-1055, authorizing the Department of Building and Safety and Bureau of Sanitation to bring these properties into compliance. Eliminating these connections will prevent 7 million gallons per day from entering the sewer system and help reduce the risk of sewer spills.

Plumbing on private properties is under the jurisdiction of Los Angeles Department of Building and Safety (LADBS). The LA Municipal code and the California Plumbing Code prohibit the connection of these drains into sewers stating "rainwater piping shall discharge to an approved point of disposal, not to a public sewer." (Section 1101.2 of the Los Angeles City Plumbing Code). The Bureau of Sanitation (BOS) is working with LADBS on inspecting these properties

and proceeding with the necessary enforcement to correct these connections by disconnecting them from the sewer and connecting them to the storm drain system.

#### 2.2 SANITARY SEWER OVERFLOW REDUCTION

There are generally two types of overflows from the collection system: (1) those that occur due to capacity related problems during wet weather events; and (2) those that occur during dry weather that result from factors such as blockages due to fats, oils, and grease ("FOG"); roots; debris resulting from vandalism; and overflows due to contractor errors.

Out of the commitment to the environment and public health, the City of Los Angeles Board of Public Works proactively set a goal of reducing the number and impact of future City-Caused Sanitary Sewer Spills (SSOs) to the maximum extent feasible. By a 5-0 vote on July 22, 2001, the Board of Public Works has set a goal to reduce wastewater spills by 25 percent by December 2005.

Capacity upgrades to the City's collection system are being constructed and others are scheduled in the City's 10-year Capital Improvement Expenditure Plan (CIP). These upgrades will reduce wet weather sanitary sewer overflows. Not including City labor costs, the City has budgeted a total of nearly \$1.7 billion toward improvements to the City's collection system for fiscal years 2002 and 2003 through 2010 and 2011. Thus, the City has committed over \$170 million per year toward improvements to the City's wastewater collection system set forth in the City's 10 year capital improvement expenditure plan.

The Bureau of Sanitation has increased its efforts to reduce wastewater spills by initiating a new aggressive sewer cleaning and public education program. This extensive sewer cleaning program is designed to reduce the two major causes of spills – tree roots invading lines and fats, oils and grease from food-service establishments clogging sewers.

#### 2.3 WET WEATHER PREPAREDNESS AND OPERATION PLAN

The City's Wet Weather Operation Plan is necessary to protect the public, the environment, and the wastewater and storm water facilities during storm events. The facilities operated by the Bureau of Sanitation are in the best state of readiness. Nevertheless, flooding of streets may still occur as streets are an integral part of our flood damage control system and are designed to carry runoff.

Each of the facilities and operating divisions prepared a wet weather preparedness and operation plan for their individual facilities and divisions. The Bureau of Sanitation's plan is the integration of all these plans. The focus of the plan is:

- To protect the public health and safety.
- Ensure the readiness and operation of our facilities, including all primary and backup components.
- Anticipate and monitor weather forecasts and facility performance.
- Maximize and optimize the use of our facilities.
- Maintain stable operation.
- Minimize, monitor, and report any adverse impact on the public or the environment due to emergencies, unavoidable overflows or flooding.

In addition, the plan describes the level of preparedness, coordination, assignments and responsibilities of the various divisions and offices before, during and after a major wet weather event.

Each operating division identified specific activities to ensure the wastewater collection, treatment, and stormwater systems and landfills are protected and remain operable under wet weather conditions. These activities include: training; preventive maintenance; emergency supply acquisition and storage; equipment inspection and periodic exercise; and up-to-date emergency procedures, including notification and deployment of staff, and plan and procedures for public information and regulatory reporting.

#### 2.4 CAPACITY, MANAGEMENT, OPERATIONS AND MAINTENANCE (CMOM)

The Bureau of Sanitation led a citywide effort to prepare documentation of the City's Capacity, Management, Operations, and Maintenance (CMOM) Program in response to the U.S. Environmental Protection Agency's proposed rules for regulating sewer systems in order to minimize or eliminate Sanitary Sewer Overflows (SSOs). The proposed rules clarify the National Pollutant Discharge Elimination System (NPDES) permit requirements for operation and maintenance of wastewater collection systems and the permittees duty to diminish and mitigate SSOs. The proposed rules will most likely be adopted and enacted as part of NPDES permits for Publicly Owned Treatment Works (POTWs). CMOM general standards under the proposed rules, dated March 24, 2000, include the following:

#### Permittee must:

- (a) Properly manage, operate and maintain, at all times, all parts of the collection system.
- (b) Take all feasible steps to stop, and mitigate the impact of SSOs.
- (c) Develop a written summary of your CMOM program available to any member of the public upon request.
- (d) Provide adequate capacity to convey base flows and peak flows for all parts of the collection system.
- (e) Provide notification to parties with reasonable potential for exposure to pollutants associated with overflow events.

To meet these standards, the CMOM Program must include the following nine components:

- 1. Goals
- 2. Organization
- 3. Legal Authority
- 4. Measures and Activities
- 5. Design and Performance Provisions
- 6. Monitoring, Measurement and Program Modifications
- 7. Overflow Emergency Response Plan
- 8. System Evaluation and Capacity Assessment Plan
- 9. CMOM Program Audits

The CMOM document summarizes the City's current practices in its wastewater collection system in a format that corresponds with the nine main components of CMOM described above.

#### 2.5 CONDITION ASSESSMENT

#### 2.5.1 SEWER INSPECTION

The Wastewater Collection System Division has a regular inspection program, which includes the inspection of secondary sewers (sewers equal to and less than 15 inches in diameter) and primary sewers (sewers greater than 15 inches in diameter) by Closed-Circuit Television (CCTV). Maintenance holes (MHs), siphons, diversion structures, easements for sewers equal to or less than 15 inches in diameter, easements for sewers equal greater than 15 inches in diameter, and trap maintenance holes are physically inspected.

Inspection of the MHs include traffic control, unseal/seal MH, visual inspection of MH condition, visual inspection of flow in pipe, inspect/probe for debris, remove debris, monitor air quality, physical test of structural integrity of MH and documentation of results. For siphons, inspection includes inspection of weir boards and verification of proper pipe orientation. On diversion structures crews inspect condition of gate/stop-logs; inspection of easements requires owner's approval and for trap MH's crews inspect the weir board.

#### 2.5.2 COLLECTION SYSTEM FLOW GAUGING

The collection-system gauging program comprises four separate components, described below.

**Real-Time Gauging.** The Real-Time Gauging Program uses ADS Model 3500 monitors at 33 critical points in the City's major outfall and interceptor sewer system. The monitors are set up with a SCADA system to allow instantaneous monitoring at a central location. The monitors are also permanent and collect continuous instantaneous flow depth data, usually provided as 15-minute averages. Some of the monitors also measure flow velocity. DOS-based software enables data retrieval via modem and allows the user to analyze data, print tables or graphs, generate reports, and export data.

**Near-Time Gauging.** The Near-Time Gauging Program uses Flo-Dar Model 460 meters at 75 primary sewer locations across the City. These locations were selected to fill data gaps associated with flow modeling or planning activities responding to CDO 98-073, issued to the City by the Regional Water Quality Control Board, Los Angeles. The monitors are permanent and collect continuous instantaneous flow depth and velocity data, typically provided as 15-minute averages. Data retrieval is done manually: field crews download the data at regular intervals and then provide them to WCSD for upload to the network server. As a result, there is lag time between data collection by the monitor and data accessibility to the end user.

**Periodic/Regular Gauging.** The Periodic/Regular Gauging Program uses 32 portable Sigma Model 950 ultrasonic meters to periodically collect flow depth data at over 600 predetermined locations on the primary sewer system. The typical sampling period is 24 hours. Bureau of Engineering (BOE) Survey crews install and retrieve the portable meters for Wastewater Collection System Division (WCSD). The flow meters are installed quarterly, semi-annually or annually at a specified location depending on the flow level in the sewer; those exhibiting higher PDWF d/Ds are monitored more frequently than those with lower flow levels.

**Special Gauging.** The Special Gauging Program provides flow data for special studies or projects. Temporary gauges can be set for a specified time period, usually ranging from 1 to 7 days, on any City sewer line. As with the Periodic/Regular Gauging Program, BOE Survey crews install and retrieve the temporary gauges, which include Manning recorders (Dippers), Stevens recorders (Type A), and Sigma Model 950 units. Stevens recorders (Type A) are used as part of contractual obligation from Financial Management Division (FMD) of Bureau of Sanitation.

#### 2.5.3 CLOSED-CIRCUIT TELEVISION (CCTV) INSPECTION

As part of the City's commitment to improve the City's sewer system, the Bureau of Sanitation has implemented an aggressive CCTV/condition assessment program. In 2003 the Bureau of Sanitation increased the CCTV/condition assessment schedule to about 600-650 miles of sewer per year. At this rate the City will complete the internal inspection of all sewers within the City's collection system, including both primary and secondary sewers, in approximately the ten years. The CCTV of primary sewers is prioritized by systems based mostly on age and materials, while secondary sewers are prioritized by basins based primarily on operational requirements, i.e., basins with higher spill rates and cleaning requirements receive a higher priority than those with lower rates and requirements.

Based on the review, the sewers are ranked based on the number and severity of the defects in the segment. Currently, the sewers are ranked with condition categories A, B, C, D, and E. Below is a summary table for the different condition categories and what they signify.

Condition Category	Condition	Sample defects for condition category	Action/Estimated Response Period
А	Very Good	Condition is almost like new sewer pipe	No repairs - Follow-up inspection 25 years
В	Good	Light Cracks localized Light corrosion localized Light roots localized	No immediate repairs - Follow-up inspection 15 years
С	Fair	Moderate Cracks/fractures Moderate corrosion continuous Moderate Infiltration continuous Moderate roots continuous	Routine repairs - 5 to 10 years
D	Poor	Severe cracks/fractures Broken pipe with holes Severe corrosion Severe infiltration/roots	Expedite repairs - 2 to 5 years
E	Emergency	Collapsed pipe/street Dirt Pipe Crown of Pipe gone Void in Backfill Full flow obstruction/blockage	Emergency repair – Within 1 to 2 months

The goal of the CCTV program is to identify and eliminate all the "E" sewer segments, as well as to eliminate/reduce the number of "C" and "D" segments in the system over time. As part of the CCTV program, the observed flow depth information will also be used to assist in determination of sewers to be upgraded/upsized.

#### 2.6 Fats, Oils, and Grease (FOG) Control

#### 2.6.1 FOG ORDINANCE

The City's FOG Control Ordinance became effective on August 5, 2001. The Ordinance provides the legal authority for the FOG Control Program to regulate about 10,000 Food Service Establishments (FSEs). The initial permitting was originally scheduled over a five-year period with approximately 2000 permits to be issued annually starting with the highest priority areas. The City increased permitting resources in an effort to complete the permitting earlier. The City's FOG Control Ordinance requires the following:

- (a) All FSEs that discharge grease are required to obtain an industrial wastewater permit.
- (b) FSEs are required to pay a one-time \$356 application fee, and a \$244 inspection and control fee annually.
- (c) FSEs will be inspected a minimum of once per year.
- (d) All FSEs will be required to use best management practices (BMPs) to reduce grease discharged to the sewer system.
- (e) Any FSEs known to cause grease-related sewer spills or failing to implement BMPs will be required to install a grease interceptor or grease trap when it is not feasible to install a grease interceptor.
- (f) All new construction of FSEs must include installation of a grease interceptor.
- (g) All FSEs planning a remodel valued at \$100,000 or more will be required to include installation of a grease interceptor.

- (h) Exemptions, conditional waivers, or variances will be available to FSEs that do not generate grease, do not cause grease blockage impacts to the sewer system, and/or have such limited space on their property that it is impossible to install a grease interceptor.
- Garbage grinders are prohibited in FSEs except when allowed by the Director of the Bureau of Sanitation.

Since program inception on October 15, 2001, the City has accomplished the following activities related to the FOG program:

- Inspected FSEs and informed them of all applicable ordinance and BMP requirements.
- Conducted follow-up inspections to verify compliance.
- Issued Industrial Waste Permits (IWPs) and determined that which FSEs were exempt from permit requirements.
- Issued Notices of Violations, mostly for failure to apply for an industrial wastewater permit.

#### 2.6.2 SEWER CLEANING AND MAINTENANCE

The City has an extensive proactive and preventive maintenance program for its sewer system. The preventive maintenance is focused on critical and problematic areas. The critical sewers are identified, prioritized, and scheduled for maintenance based on maintenance history and system characteristics. All problem sewers, especially those that have experienced spills or backups, are scheduled for follow-up inspection with closed circuit televising to identify any necessary repairs or special maintenance needs. This is in addition to the planned upgrade and improvement projects.

In addition to the focused preventive maintenance, the City has implemented a proactive maintenance program where "non-problem" sewers are cleaned, but on a less frequent basis. The City has developed and is currently implementing a proactive maintenance program that provides cleaning and maintenance of the entire system at least once every five years.

#### 2.7 ROOT CONTROL PROGRAM

The City of Los Angeles has experienced sewage spills from the collection and conveyance portions of the wastewater system. Sewage spills are in violation of the National Pollutant Discharge Elimination System (NPDES) permits and are prohibited by the various Federal and State governing regulatory requirements and codes.

Root infestation has caused an estimated 50 percent of the spills in the collection system, mainly in small line sewers 6 to 12 inches in diameter. Although the City has made key improvements to its operation, maintenance and inspection program, mechanical methods of clearing root debris used by the City until recently did not adequately reduce continuing root problems. Therefore, the City recently implemented a chemical application process that may offer a longer-term solution to the root infestation in the collection system.

Total decomposition of the roots may take several months to a year or more. The City plans to treat root infested sewers every two years.

#### 2.8 CHEMICAL APPLICATION PROGRAM FOR ODOR AND CORROSION

In an effort to control odor and corrosion in the wastewater collection system, the Bureau of Sanitation implemented a chemical application program. Collection system odors are controlled by the addition to the wastestream of 50 percent caustic soda (sodium hydroxide) by means of shock dosing and by the continuous addition of ferrous chloride.

During summer 2001, the Bureau evaluated magnesium hydroxide as a possible replacement for ferrous chloride by continuously adding 63 percent magnesium hydroxide slurry into the North Outfall Sewer (NOS). The application of magnesium hydroxide to the crown or soffit of the sewer pipeline controls collection system corrosion. The following is a summary of each aspect of the chemical application program.

#### 2.8.1 SHOCK DOSING FOR ODOR CONTROL

**Sodium Hydroxide** – Caustic shock dosing was implemented by the City in October 1997 to mitigate on-going and growing odor complaints in the South Los Angeles area. Caustic shock dosing is being performed in the South Central Los Angeles and Country Club Park areas. A 50 percent sodium hydroxide (caustic) solution of up to 4000 gallons is added directly to the sewer at key injection points at a rate of 150 to 200 gallons per minute (gpm). This application rate will produce a pH of 12.5 to 13 in the sewer line with a minimum retention time of thirty minutes.

These conditions inactivate the bacteria residing in the slime layer of the pipe, thereby reducing the dissolved sulfide levels in the wastestream and the resultant hydrogen sulfide odors in the Maze Area. Treatment is performed five times per week in the South Central Los Angeles area and three times per week in the Country Club Park area. Applications in the South Central Los Angeles sewers control sulfide generation in these lines resulting in reduced levels of hydrogen sulfide gas concentrations on the South Branch of the Maze on Martin Luther King Road. Applications in the Country Club Park area control odors along the Hollywood Main Sewer and on the North Branch of the Maze on Rodeo Road.

Due to the extreme pH conditions caused by the addition of caustic soda to the sewer, notifications of the shock dose schedule are distributed bi-weekly to various City departments and affected contractors to announce time and locations of sewers affected, to avoid contact of the wastestream while shock dosing is occurring.

#### 2.8.2 CONTINUOUS CHEMICAL ADDITION FOR ODOR CONTROL

**Ferrous Chloride** – Ferrous chloride is added continuously to the NOS via the Boyle Heights Sewer System. A 35 percent solution of ferrous chloride is injected into the wet well of the Union Pacific Pump Plant at a rate of 180 gallons per hour (gph).

Ferrous chloride reacts with sulfide to produce an insoluble precipitate, which prevents the release of hydrogen sulfide into the sewer headspace. Application to the NOS controls odors in the Boyle Heights area, the NOS, and the North Branch of Maze area in the Crenshaw District of South Los Angeles. The ferrous chloride proceeds to the Hyperion Treatment Plant via the North Central Outfall Sewer (NCOS). Due to diversion structures in the NOS, the ferrous chloride partially treats the Central Outfall Sewer (COS) and the South Branch of the Maze.

**Magnesium Hydroxide** – The Bureau of Sanitation evaluated a continuous addition of magnesium hydroxide. The pilot test is scheduled to begin late-July 2001 for eight weeks. Chemical addition will take place at the Los Angeles Glendale Water Reclamation Plant LGWRP). The chemical will be introduced directly into the NOS. Magnesium hydroxide controls hydrogen sulfide evolution by providing both a slightly soluble acid acceptor and a sulfide complexing action. Through modest pH elevation, hydrogen sulfide evolution can be safely and effectively controlled. Results have shown that this treatment process can be an option for odor control in the City's sewer system. The data shows that magnesium hydroxide will provide good overall economics, while improving safety and odor control performance.

#### 2.8.3 Crown Spraying For Corrosion Control

On an annual basis, a 53 percent magnesium hydroxide slurry is applied to the crown of about 50 miles of primary sewer (15 inches and greater). The slurry will neutralize corrosive acids and deactivate acid producing bacteria residing on the soffit or crown of the sewer. This application will control the corrosion process and minimize structural deterioration of the sewer. Field data demonstrates a single application provided enough alkalinity to protect concrete surfaces for over a year.

The treatment can be likened to spray painting, although the mechanism of protection is acid neutralization rather than a simple barrier. The spraying device is pulled through the pipe on a floatation "boat." The spray heads are positioned so the slurry is applied from waterline to waterline. The pull rate and pumping rates are predetermined by pipe diameter to give a uniform desired thickness of applied material.

#### 2.9 FLOW MODELING

#### 2.9.1 MOUSE HYDRAULIC MODEL

MOUSE is a state-of-the-art hydraulic and dynamic flow routing model, which is generally used for identifying problem areas resulting from current and future flows as well as during significant rain events. The City uses the MOUSE model as part of an extensive advance-planning program that identifies the existing capacity deficiencies and future needs for its wastewater facilities.

The City purchased MOUSE in 1993 and since then has customized it to the City's system. MOUSE is continuously being updated with current Southern California Association of Governments (SCAG) population and industrial flow data. It is calibrated by flows that are measured in the system. MOUSE was developed and is supported by the Danish Hydraulic Institute (DHI). It is linked to ESRI's ARC-View GIS software.

The MOUSE model contains the City's major interceptor and outfall system, as well as other segments of the primary system and is capable of generating information for the following analyses:

- Projecting future flows routed through the sewer system
- Predicting surcharge and overflows for nodes and pipes
- Evaluating the effects of new relief sewers
- Predicting backflows
- Evaluating the effects of new or improved hydraulic devices such as pumps, weirs, gates, etc.
- Evaluating the effects of modified operations
- Projecting wet weather flow based on hydrological parameters
- Predicting long term wet weather flow that is compounded by previous storms
- Converting sewer pipes to pressurized system when evaluating surcharged conditions
- Determining split flow ratios

The City is currently embarking on an effort to install additional flow meters to improve the calibration and accuracy of the model.

#### 2.9.2 SEWER FLOW ESTIMATING MODEL (SFEM)

The Sewer Flow Estimating Model (SFEM) is a geographic information system (GIS) based model developed using the City's wastewater planning concepts. The model uses a GIS sewer network, census data, land use, and other planning-related data for flow projections. The model is

used to generate current and future flow estimations and data preparation for dynamic hydraulic models.

The model consists of three major features: residential and employment projection tools; flow estimation at any point of the collection system; and flow accumulation for planning level analysis and capacity studies. The population model uses standard census and local government (SCAG) population inputs to apply to areas served by the City's sewer system. Since infrastructure planning often requires long range planning, the model can project population out to 100 years using census and local regional population data sources at the census tract, census block and sub-block resolutions.

The flow accumulation tools are based on the proven techniques for automatically defining tributaries and basins. These basins are used to estimate average dry weather sanitary flow, infiltration and inflow, and industrial waste sources applied to these basins. The total of these flows comprise the Average Dry Weather Flows (ADWF) and are accumulated to the downstream network using a static accumulation module. The SFEM also prepares input data for dynamic hydraulic model (MOUSE).

The following are some of the intended uses of the SFEM in the sewer planning process:

**Population:** Distribution for short-term and long-term horizons; analysis and comparisons of growth over time for City and contract agency areas, analysis of various growth scenarios.

**Flows:** Current and future flow estimation; flow estimation for master plans and localized study areas; treatment plant and pumping plant study area analysis; data preparation and inputs for dynamic hydraulic models.

**Alternative analysis:** Impacts of changing current configuration, e.g., by adding new sewers and diversions are evaluated.

**Other:** Identification of strategic flow gauging locations, calibration of estimated flows, management of industrial discharges, downstream and upstream traces of sewer network, treatment plant location analysis, etc.

#### 2.9.3 NEXRAIN

The NEXRAIN Corporation maintains a national database of 15-minute, 2 km x 2 km radar-rainfall estimates. Approximately 6.5 million rainfall estimates are received via satellite and stored on-line at NEXRAIN facilities in Folsom, CA every 15-minutes. NEXRAIN extracts the radar-rainfall estimates for the target areas from their database for the specified time periods then calibrates the radar estimates with local rain gage observations. This process assures that the radar-based estimates are consistent, on average, with the local rain gage observations.

The City has recently contracted with NEXRAIN to obtain rainfall data recorded by dopler radar methods. The City currently has two years of data (1994–1995 and 1995–1996). This data shows the intensity pattern of actual rainstorms. This data is excellent for evaluating the impacts of historical storms and eventually refining the wet weather model but its current usefulness is somewhat limited because of lack of long-term data and analysis in terms of affects of variable storms. More data and analysis is needed to develop credible storm intensity patterns that can be confidently used for system evaluation. Rainfall data from NEXRAIN needs to be correlated with measured flows to determine the RDI/I parameters for the wet weather model. A NEXRAIN type system coupled with real time flow data will be a powerful tool that can be used to optimize system performance in the future. Data from NEXRAIN will be used to refine the MOUSE model in the future.

NEXRAIN uses radar (has the ability to see the spatial distribution of rainfall, but does not estimate the actual rainfall amounts) and rain gages (has the ability to measure rain falling on the

gage, but does not estimate what happens between the gages) together to create a product that combines the strengths of each approach while minimizing their respective weaknesses. NEXRAIN's gage-adjusted radar-rainfall estimates provide high resolution spatially distributed rainfall estimates that are, on average, consistent with rain gage observations at each time step.

### 2.10 SEWER CAPACITY AVAILABILITY REQUEST (SCAR)

The Bureau of Sanitation's Wastewater Engineering Services Division is responsible for determining the sewer capacity availability for new sewer connections for residential, commercial and industrial developments. This function is part of an overall sewer connection permitting process that involves a combined effort by Bureau of Sanitation and Bureau of Engineering personnel.

In issuing a sewer connection permit, the Bureau of Engineering's Development Services Division makes the determination if further investigation is needed to evaluate the capacity of an existing sewer line to handle the additional flow from the proposed development or project. If an investigation is needed, the Bureau of Engineering's Development Services Division submits a request to the Bureau of Sanitation's Wastewater Engineering Services Division.

A developer or owner applies for the sewer availability request to the Bureau of Engineering Development Services Division. If the flow is less than 5,000 gallons per day (gpd) based on an estimated sewer generation rate table, the Development Services Division can make the determination to issue permit. If the flow is greater than 5,000 gpd, a sewer availability request form is submitted to the Wastewater Engineering Services Division.

The form identifies the type of building use, point of sewer connection and the estimated sewer flow generated from the project. The Wastewater Engineering Services Division will make a determination based on flow gauging if there is capacity in the existing sewer line to handle the flow. The determination will be based on the maximum flow design limit of d/D = 0.5.

Once the determination is made whether capacity is available, it is noted in the SCAR form and returned to the Development Services Division. If there is capacity available, Development Services Division issues the sewer connection permit. If there is no capacity available, the developer or owner will have to work with the Bureau of Engineering to determine if the existing sewer needs to be upsized or the flow can be split into another sewer line.

#### 2.11 BUILDING PRIVATE PROPERTY SEWERS

The sewage from a building is carried through the building's sewer pipe to the property line. At the property line, the building's sewer pipe is connected to a 6-inch house connection sewer (also known as a lateral connection or service connection), which carries the sewage to a local mainline sewer line (usually an 8-inch clay pipe under the middle of the street). Collector and interceptor sewers collect the sewage from local sewers and carry it to an outfall sewer. Outfall sewers are very large pipes, sometimes up to 10 feet in diameter. These pipes carry the sewage to the treatment plants. At the treatment plants, solids are separated from the water. After treating the water, it is discharged into the ocean, used for irrigation, or pumped back into the ground.

Storm drain connections are made from the property line to a catch basin or a storm drain pipe in the public right-of-way. The storm water is collected in area drains on private property. The area drains may be connected to the storm drain connection pipe at the property line.

To connect to the City Sewer System, a property owner must obtain a Sewage Facilities Charge (SFC)/Bonded Sewer Fee Certificate and a Sewer Permit from the appropriate district office. SFC or Sewer Certificate is the cost of design and construction of all sewer facilities (local, collector,

interceptor, outfall sewers and treatment plants) and is collected to pay for these sewer infrastructure improvements.

#### 2.12 SEWER AND STORM DRAIN CONNECTIONS

The City has two separate systems to dispose of rainwater and wastewater. The Storm Drainage System is intended to receive water that is collected through roof drains, area drains, deck drains, etc. and send it to the ocean through a series of storm drain channels and pipes. The City Sewer System collects wastewater and, through an elaborate piping system, sends it to the City's Hyperion Wastewater Treatment Plant. Storm drains must not be connected to the City Sewer System because it overwhelms the system during heavy rains and causes wastewater overflows (Section 94.1102.2 of the Los Angeles Municipal Code). When these overflows occur, the City is subject to enforcement action under the Clean Water Act, resulting in fines and penalties.

To eliminate illegal connections and reduce the risk of future sewer spills during rainstorms, the City conducted dye or smoke tests to verify whether or not there are any illegal connections from private properties connected to the City's Sewer System that should be connected to the City's Storm Drain System. If storm drain connections to the City's Sewer System are found, private owners are notified to bring their property into proper compliance by disconnecting these drainage pipes and properly connecting them to the City's Storm Drain System.

#### 2.12.1 THE S-PERMIT

LAMC, Section 64.12 states:

No person shall make, construct, alter, or repair any house connection sewer, bonded house connection sewer, special house connection sewer, industrial waste sewer connection, industrial waste storm drain connection, storm drain connection, or special drainage connection, or any portion of such sewer or storm drain connections, including sampling manholes, or connect and house sewer, soil pipe, or plumbing to any such sewer or storm drain connections or to a sewer or storm drain under the jurisdiction of the City of Los Angeles, without first obtaining a written permit therefore from the Board of Public Works.

The Bureau of Engineering issues this permit, called the S-Permit. Before the S-Permit is issued for a new house connection sewer, the Sewerage Facilities Charge (SFC) and Bonded Sewer Fees, if applicable, must be paid.

The SFC is collected at the time of processing a building permit application for a new building, addition to an existing building, and/or a change of use of the existing building. Buildings built before June 17, 1970, were "grandfathered" in. This charge depends upon the usage of a property and the area of the building. It represents the public's share of the cost of design and construction of sewer facilities. SFC credits are also available and are based on the use and area of buildings demolished after June 16, 1970. These credits can be used to offset SFC fees.

Bonded Sewer Fees apply to persons desiring a permit to connect or construct a Special House Connection Sewer or Bonded Sewer House Connection Sewer. If the property in question is rectangular and has an ordinary area of about 6,500 square feet, the charge is assessed per front foot of the lot. Modifications to this charge can be made for irregular shaped lots.

#### 2.12.2 Types of Connections

**Property Line Connection:** Sewer main lines (local sewers) are in the public rights-of-way (streets) and in the public sanitary sewer easements over private properties. If a service connection (pipe from the local sewer to the property line) is available, then the S-Permit is for a

property line connection. The City's sewer maps show the availability of this service connection. A regular plumber or contractor may obtain this "property line connection" S-Permit.

**New Lateral, House Connection or Service Connection:** If a house connection sewer is not available at the property line, then the permit is for the construction of a new house connection sewer. In this case, the permit is issued to a Bonded Sewer Contractor only. There is a special qualification given to these contractors for working in the public rights-of-way by the Board of Public Works, per LAMC Section 64.15.1. Each lot must have a separate sewer connection. If a property is split and there are separate buildings on each lot, then each building must have its own separate connection.

#### 2.13 SATELLITE AGENCIES

Since 1998, the City has negotiated new service agreements with 14 of the 27 agencies that it provides wastewater service by contract. The City is nearing completion of negotiations with two more agencies, the Cities of Burbank and Glendale. These new agreements contain common provisions, called the "Universal Terms," and a requirement that any future agreements be compatible with the Universal Terms.

The Universal Terms require that the agencies monitor the flow and strength of their wastewater flowing into Los Angeles at each location where the flow exceeds 0.5 cubic feet per second. They may estimate their flows and strengths, based on the numbers and types of their customers, at locations with smaller flows. This provides a reasonably accurate calculation of the total flow contributed by each agency, but does not measure any infiltration and inflow (I/I) entering sewers upstream of the ungauged locations. There is also no specific requirement that agencies control their I/I. However, the agencies are required to comply with all federal and state laws and regulations, which would include the I/I-related provisions of the Clean Water Act and Code of Federal Regulations.

The Universal Terms include no limits on the agencies' wastewater flows into the Los Angeles sewer system. Such limits in the older agreements were generally not enforced. The agencies pay up-front their proportionate shares of the costs of expanding the City's wastewater system to accommodate additional wastewater, similar to the City's internal customers. In addition, the agencies are required to pay connection fees (called Amalgamated System Sewerage Facilities Charges or ASSFCs) for development occurring in their jurisdictions. Each year, the agencies' charges are credited by proportionate shares of the ASSFCs received from other agencies and calculated for Los Angeles to compensate them for their initial investment in expanding the system. In this way, the agencies are treated much like internal City customers. Though this system does not limit the agencies' wastewater flows, it provides equal access to system capacity for all users in the City's service area and requires that agencies' pay for the capacity needed to accommodate their growth. By also paying the annual service charges (called Amalgamated System Sewer System Charges or ASSSCs), agencies are required to pay the full costs of service to their new customers. Growth in flows from the agencies is therefore, somewhat restricted in that they pay the full costs of new service.

The Universal Terms do not include provisions specifically requiring the agencies to adopt the City's standards in permitting new connections in their jurisdictions. However, the agencies are required to "... exercise reasonable care and skill and ...act as a prudent manager to ensure compliance with all federal, state, and local laws, regulations, and rules pertaining to the discharge of wastewater, including without limitation, all applicable pretreatment standards and effluent limitations, if any."

Appendix H Primary Sewer Modifications Upstream of Tillman

### Primary Sewer Modifications Upstream of Tillman Water Reclamation Plant

#### New sewer lines between the following Maintenance Holes:

- 1. 430-02-139 and 430-02-140, dia 5.5', on Victory Boulevard between Etiwanda Avenue and Lindley Avenue (AVORS or Airline)
- 2. 430-02-140 and 430-02-142, dia 5.25', on Victory Boulevard between Etiwanda Avenue and Lindley Avenue (AVORS or Airline)
- 3. 430-02-124 and 430-02-140, dia 3.75', on Victory Boulevard between Etiwanda Avenue and Lindley Avenue
- 4. 398-07-091 and 429-03-089, dia 2.5', on Raymer Street between Noble Avenue and Burnet Avenue
- 5. 398-03-086 and 398-08-068, dia 2.5', Reach does not lie on Right of Way
- 6. MH 398-03-086 lies on Orion Avenue North of Stagg Street
- 7. MH 398-08-068 lies on Stagg Street between Haskell Avenue and Aqueduct Avenue

#### Double the size of existing pipes between the following Maintenance Holes:

- 1. 397-14-172 and 397-14-177, doubled to dia 3' on Vanowen Street between Canby Avenue and Etiwanda Avenue
- 2. 397-14-177 and 397-14-183, doubled to dia 3' on Vanowen Street between Etiwanda Avenue and Lindley Avenue
- 3. 397-14-183 and 430-02-150, doubled to dia 3' on Vanowen Street and Lindley Avenue

#### Remove or Abandon the sewer lines between:

1. 430-02-124 and 430-02-149 of dia 2.5' on Victory Blvd Between Etiwanda Avenue and Lindley Avenue (NOS)

# Appendix I IRP Biosolids Projections and Costs Technical Memorandum



## **Technical Memorandum**

To: File, Integrated Resources Plan

From: Ruth Roxburgh, Charles Turhollow

Date: February 27, 2004

Subject: IRP Biosolids Projections and Costs

## **Modeling and Biosolids Projections**

As part of the City of Los Angeles Integrated Resource Plan (IRP), a process model was developed for the Hyperion Treatment Plant (HTP). The model was calibrated for current operation of the plant, and then used for making future projections, given the most likely scenario of treatment options in the upstream treatment plants and at HTP. The basis for the model is documented in the IRP Facilities Plan reports, and will not be discussed in detail in this TM. The flows and loads used in the model and the corresponding solids projections are shown below in Table 1.

**TABLE 1**City of LA Hyperion Treatment Plant Conceptual Planning Level Influent Parameters<sup>1</sup> and Solids Projections<sup>2</sup>

Parameter	Current Conditions	2020 Projections <sup>3</sup>
Annual Dry Weather Flow (MGD)	335	450
Influent TSS (mg/l)	337	325
Influent BOD (mg/l)	293	300
Digested solids (lb/d)	587,893	743,224
Dewatered cake dryness (%)	32%	32%
Dewatered cake solids (dtpd) <sup>4</sup>	265	335
Dewatered cake (wtpd)	830	1,050

TABLE 1
City of LA Hyperion Treatment Plant Conceptual Planning Level Influent Parameters<sup>1</sup> and Solids Projections<sup>2</sup>

Parameter	Current Conditions	2020 Projections <sup>3</sup>
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<sup>&</sup>lt;sup>1</sup>Data provided by Curt Roth 08/21/03

However, it was brought to the attention of the IRP team that the biosolids volumes under the "current conditions" model run for HTP did not match the volume of biosolids leaving the plant. HTP staff report that an average of 680 wtpd of biosolids cake leave the plant, and are currently using 700 wtpd as a planning number, whereas the model results predict 830 wtpd, as shown above in Table1.

Plant data for the HTP digesters for February through September 2003 were reviewed. The average digested solids produced were found to be typically around 300 dtpd (600,000 lb/d), which is in line with the model results shown in Table 1. To address this, plant solids data for October through December 2003 were requested. The review of the HTP monthly mass balance reports provided are summarized in Table 2.

TABLE 2 HTP Solids Data<sup>1</sup>

Parameter	October 2003	November 2003	December 2003	Average Cumulative Change in Solids
Digested solids (lb/d) <sup>2</sup> (dtpd)	538,090 269	586,213 293	562,700 281	-
Dewatered solids (lb/d) (dtpd)	444,000 222	502,000 251	444,000 222	17.7%
Cake dryness (%)	30.9	31.8	31.4	
Hauled solids (dtpd)	191	210	200	28.7%
Hauled cake (wtpd)	618	660	637	

<sup>&</sup>lt;sup>1</sup>From HTP Monthly Mass Balance Reports

<sup>&</sup>lt;sup>2</sup>Solids projections from 10/28/03 model runs

<sup>&</sup>lt;sup>3</sup>Projections for flows range from 435 to 500 mgd, depending on upstream treatment, but loads remain the same in terms of lb/d

<sup>&</sup>lt;sup>4</sup>Assumes 90% capture rate in centrifuges.

<sup>&</sup>lt;sup>2</sup>Estimated that 8,000 lb/d (≈1.5%) of solids are subsequently lost through digested sludge screens

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These results were then discussed by the IRP wastewater team, including City staff on the team. It was noted that in the past that City staff have not been able to resolve the differences in the solids mass balance for HTP. As the IRP model has been calibrated for the liquid treatment processes, and the digested solids are in the range seen by the plant, it was decided that the model should not be changed. However, the truck scales are certified, the truck waybills are legal documents, and the IRP team staff are not aware of any reported difference between trucks weighed at the plant and on the state highways. Therefore, to resolve the differences, it was agreed that a correction factor would be applied to the model results for biosolids production. The model allowed a 10 percent loss of solids through the dewatering process. Table 2 shows that the average change in solids from digested solids through to the truck loading is 28.7%. It is therefore recommended that a correction factor of 18% be applied to the cake solids generated in the IRP model. Thus the recommended IRP numbers based on the model with correction factor are:

- Current HTP dewatered cake 681 wtpd
- Projected HTP 2020 cake 861 wtpd

The following table will replace the biosolids production numbers that were reported in the IRP Draft report:

TABLE 3
Current and Future Biosolids Production

Parameter	Current Capacity				2020 Pr	ojections
	HTP TITP		TITP	HTP	TITP	
	Rated	Operational	Rated	Operational		
Flow, MGD (annual average)	450	335	30	17	450	19
Biosolids, dtpd	-	217	-	11	275	12
Solids concentration %	-	32	-	22	32	22
Dewatered biosolids wtpd	-	681	-	50	861	56

HTP data presented are based on the Pro2D modeling with biosolids correction factor. TITP data from plant staff.

cc: Curt Roth, CH:CDM Hector Ruiz, CH:CDM Heather Boyle, CH:CDM Judi Miller, CH:CDM

## **Appendix J Biosolids Rules and Regulations**

### Appendix J Biosolids Rules & Regulations

This summary of the rules and regulations related to biosolids management consists of two main areas - rules pertaining directly to biosolids, such as the Part 503 regulations, as well as some of the air quality focused regulations that could impact biosolids management options. The summary includes four phases of legislation:

- Current regulations and policies: those which are in place and are part of a permit, order, or other enforceable tool.
- Emerging regulations and policies: those already adopted, but not yet included in a permit order or other enforceable tool.
- **Proposed regulations and policies:** those in various development stages, but not yet adopted.
- "Crystal Ball" regulations and policies: issues that have the potential of becoming a regulation or policy in the future. In developing these stages, and in applying them to specific regulations, the staff and consultants based their opinions on experience, communication within industry and regulatory agency leaders, and understanding of the regulatory environment in which the City's wastewater program operates.

These include regulations at the federal level, the state level, local county ordinances, City of Los Angeles regulations as well as permits for composting and land application.

#### **Biosolids Regulations and Policies**

Table J-1 lists the current biosolids regulations that need to be considered in evaluating biosolids management options for the City, with brief descriptions.

Table J-1							
Curi	Current Biosolids Regulations and Policies						
Regulations and Policies	Agency	Phase	Key Issues				
Federal Regulations	Federal Regulations						
40 CFR Part 503 (Regulations governing handling/treatment of biosolids)	EPA	Current	Any biosolids with pollutants greater than the ceiling concentrations as listed in Section 503.13 Table 1, cannot be land-applied. Dioxins in biosolids will not be regulated.				
National Biosolids Partnership: Biosolids Environmental Management	City of Los Angeles	Current	The biosolids should be managed properly to gain and maintain public acceptance.				



Curre	Table J-1 Current Biosolids Regulations and Policies				
Regulations and Policies	Agency	Phase	Key Issues		
United States Department of Agriculture (USDA) – National Organic Program	USDA	Current	This rule excludes the use of sewage sludge (biosolids) as defined in 40 CFR Part 503 for organic crop production.		
State Regulations		1			
SB 205: Amendments to the Porter-Cologne Water Quality Act (development of waste discharge requirements for biosolids)	State & Regional Water Quality Control Board	Current/Emerg ing	The General Order issued by SWRCE in the Final EIR dated June 2000 covers the general waste discharge requirements for biosolids land application; updated EIR completed in March 2004, court ruling is pending.		
California Integrated Solid Waste Management Act, Assembly Bill 939 (AB 939)	California Integrated Waste Management Board (CIWMB)	Current	Each municipality of California would have to divert 50 percent of its waste from landfills by 2000.		
California Integrated Solid Waste Management Act, Alternative Daily Cover regulations (revisions to Title 27 Code of California Regulations Sections 20685, 20690, 21600)	CIWMB	Current	Biosolids or compost ADC at landfills must be 6" to 12" in thickness; compost grain size of 95% < 6"; biosolids must be <25% of ADC material on quarterly basis.		
Local Regulations	1	T			
Central Valley Regional Water Quality Control Board (CVRWQCB) Order No. 95-140	CVRWQCB	Current	Basis of waste discharge requirements for application of biosolids to agriculture, forests and reclamation, within the Central Valley.		
Kern County Biosolids Ordinance	Kern County	Current	This ordinance bans the land application of non-EQ biosolids starting in 2003. Requires salmonella & coliform stds. to be met at time of application.		
Kings County Biosolids Ordinance	Kings County	Current	This ordinance bans the land application of non-exceptional quality biosolids in 2003 & non-compost products in 2006.		
Riverside County Biosolids Ordinance	Riverside County	Current	This ordinance prohibits the land application of Class B biosolids & a second ordinance regulates EQ biosolids.		



Table J-1					
Current Biosolids Regulations and Policies					
Regulations and Policies	Agency	Phase	Key Issues		
San Bernardino Biosolids Practice	San	Current	The use of biosolids is practically		
	Bernardino		banned.		
	County				
Other Counties/City Ordinances	Counties and	Current/	In many jurisdictions, biosolids have		
	Cities	Proposed	been either banned or are proposed to		
			be banned		
Section 64 of Los Angeles	City of Los	Current	Section 64.3 of this ordinance		
Municipal Code (Los Angeles	Angeles		provides for the regulation of		
Industrial Waste Control			dischargers to the POTW through the		
Ordinance)			issuance of Industrial Wastewater		
			Permits.		
Griffith Park Composting Permit	Los Angeles	Current	California Integrated Waste		
	Local		Management Board (IWMB) permit		
	Enforcement		was issued on April 3, 1997 pursuant		
	Agency/		to the requirements of 27 CCR,		
	California		Division 2, Subdivision 1, Chapter 4.		
	IWMB				
Conditional Use Permits	Local	Current	For a composting site, local planning		
	Jurisdictions		agencies issue conditional use permits		
			and the compost meet the most		
			stringent "EQ" requirements.		

Emerging regulations are those that have been adopted, but are not yet enforceable. Proposed regulations and policies are those in various stages of development and are not yet adopted. The emerging and proposed regulations and policies that relate to biosolids management, by program and agency, are summarized in Table J-2.

Table J-2						
P	Proposed Regulations and Policies					
Regulations and Policies	Regulations and Policies Agency Phase Key Issues					
Radioactive Materials in Sewage	EPA/	Proposed	Determine the extent to which			
Sludge	NRC/		radioactive contamination of sewage			
	ISCORS		sludge, ash and related by-products is			
			occurring.			
40 CFR Part 503: Limits for	EPA	Proposed	New pollutant concentration limit and			
Molybdenum in Land Applied			new pollutant loading rate for			
Biosolids			molybdenum in land applied biosolids.			



Table J-2						
P	Proposed Regulations and Policies					
Regulations and Policies	Agency	Phase	Key Issues			
Persistent Bioaccumulative Toxic	EPA	Emerging	The proposed rule addressed lowering			
Chemicals reporting thresholds of			of reporting thresholds for certain PBT			
PBTs			chemicals, the addition of certain PBT			
			chemicals, addition of a dioxin and			
			dioxin-like compound category, toxic			
			chemical release reporting, and a			
			community right-to-know requirement.			

The crystal ball regulations and policies are issues that have the potential of becoming a regulation or a policy in the future. These regulations and policies, by program and agency, are summarized in Table J-3.

Table J-3				
Cr	ystal Ball Regu	lations and Po	olicies	
Regulations and Policies	Agency	Phase	Key Issues	
California Department of Food and	CDFA	Crystal Ball	CDFA is considering a distribution tax	
Agriculture (CDFA): Fertilizer			for biosolids to cover independent	
Regulation			sampling and testing of biosolids,	
			enforcement and research programs.	
Beyond EQ Cake	Local	Crystal Ball	Local ordinances that ban land	
	Jurisdictions		application of all biosolids except for	
			specified products such as compost or	
			granules, as has been done in Kings	
			County.	

#### Current Air Quality Regulations and Policies Related to Biosolids

Air quality has become an increasingly important issue associated with wastewater treatment. With advances in emission control technology and improved testing methods, publicly-owned treatment works (POTWs) have been considered for air quality regulation. Locally, the SCAQMD has had an air quality permitting system in place for many years; however, the passage of 1990 Clean Air Act Amendments (CAAA) has increased air quality awareness at a national level. Air quality regulations may impact the ability to site a biosolids treatment process, and may impact some of the equipment that supports the biosolids process, such as boilers. The need to meet strict air quality standards may also increase the cost of biosolids processing compared to operations in areas with less stringent requirements. Table J-4 provides a list of the current air quality regulations that may impact biosolids management.



Table J-4					
Current Air Qua	Current Air Quality Regulations and Policies Related to Biosolids				
Regulations and Policies	Agency	Phase	Key Issues		
Federal Clean Air Act (CAA) and the 1990 Clean Air Act Amendments (CAAA) 40 CFR 50-99 CAA Title III, Section 112 ® -RMP and General Duty Clause Compliance Assurance Monitoring (CAM) Program for Title V Permits	EPA California Air Resources Board (CARB) South Coast Air Quality Management District (SCAQMD) Office of Emergency Services (OES)	Current	Basic elements of the act include national ambient air quality standards for major air pollutants, hazardous air pollutants standards, state attainment plans, stationary source emissions standards and permits, and enforcement provisions.		
Federal Clean Air Act, Section 129,New Source Performance Standards (NSPS)	EPA	Current	Addresses emissions from solid waste combustion. Establish performance standards and such standards shall include emissions limitations and requirements applicable to new units and existing units.		
State Implementation Plan (for Federal Clean Air Act) and Addendum to the 1997 Air Quality Management Plan (AQMP)	EPA CARB SCAQMD	Current	1997 AQMP represents the first plan addressing Clean Air Act requirements to demonstrate attainment of federal PM10 ambient air quality standards. 2003 AQMP proposes to reduce the emission levels of the air contaminants.		
Composting and Related Operations - Rule 1133	SCAQMD	Current	It addresses development of an emissions inventory & removal rates for emissions control for composting operations.		
Title V-Operating Permits, 1990 Clean Air Act Amendments , Title V, Rules 3000-3007	EPA SCAQMD	Current	Based on a tiered grouping matrix, major sources were required to apply for a new "Facility Permit" that combines existing and future equipment permits into one overall permit covering all equipment within single facility.		
Odor and Dust from Treatment Plant General Order # 034	SCAQMD Local Jurisdictions such as the Cities of Los Angeles and El Segundo	Current	It addresses the handling of complaints relating to odor and dust in a uniform manner and recorded accurately and resolved with every courtesy extended to the complainant.		



Table J-4				
Current Air Qua	lity Regulations	and Policies	Related to Biosolids	
Regulations and Policies	Agency	Phase	Key Issues	
California Accidental Release	Administrative	Current	Addresses the accidental releases of	
Prevention (Cal ARP) Program	Agencies – Fire		regulated substances. And requires	
	Dpts. and Local		preparation of Risk Management Plan	
	Health		for stationary sources.	
	Departments			
	OES.	_		
Air Toxic "Hot Spots" Information	SCAQMD	Current	Requires CARB to compile and	
and Assessment Act, AB 2588			maintain a list of substances posing	
			chronic or acute health threats when	
Onlife and a Tanaia Air Court and and	CARR	0	present in air.	
California Toxic Air Contaminant	CARB	Current	Identifies toxic air contaminants, with	
Act (AB 1807, Tanner Act	SCAQMD		risk assessment followed by a risk	
Environmental Justice Initiatives	SCAQMD	Current	management process  Development of Air Toxic Control Plan,	
	SCAQIVID	Current	· ·	
(1997 AQCD)			addressing long-term and short-term control strategy to reduce air toxics in	
			South Coast Air Basin.	
Proposed Amendments to the New	SCAQMD	Current	SCAQMD sets thresholds (health risk	
Source Review of Carcinogenic Air	JOAQIVID	Ourient	levels) for cancer risk and estimated	
Contaminants (Rule 1401) and			cancer cases.	
Control of Toxic Air Contaminants				
from Existing Sources (Rule 1402)				
Multiple Air Toxics Exposure Study				
(MATES-II)				
New Source Review/Best Available	EPA	Current	Updates the requirements for	
Control Technology (BACT)	SCAQMD		emergency compression ignition (i.e.,	
			diesel fueled) engines to be consistent	
			with lower-polluting engines being	
			mandated by the United States	
			Environmental Protection Agency	
			(USEPA).	
Regulation II:				
Equipment not requiring Permit	SCAQMD	Current	Identifies equipment that does not	
Pursuant to Regulation II – Rule			require a written permit to operate.	
219				
Regulation IV:	1		1	
Visible Emissions – Rule 401	SCAQMD	Current	Addresses threshold requirements for	
			single source emission.	

The emerging and proposed air quality regulations that may relate to biosolids management options are presented in Table J-5.



Table J-5					
Pr	oposed Regula	ations and Pol	icies		
Regulations and Policies	Agency	Phase	Key Issues		
Title III – Maximum Achievable	EPA	Emerging	It identifies 33 HAPs, posing the		
Control Technology (MACT)	SCAQMD		greatest potential threat to public		
Program and Integrated Urban Air			health and POTWs and landfills have		
Toxics Strategy.			been identified as the contributing		
			sources.		
Environmental Health Protection for	CARB	Emerging	The bill sets certain air quality		
Children (SB25)			standards that provide adequate		
			protection for the public, infants and		
			children.		
Environmental Justice Issues	SCAQMD	Emerging	Addressing the possibility of regulatory		
(exposure/risk)			agencies developing additional		
			environmental justice issues.		

In the crystal ball of air quality regulations, there appear to be two areas that may lead to future legislation and these are summarized in Table J-6

Table J-6 Crystal Ball Air Quality Regulations and Policies					
Regulations and Policies Agency Phase Key Issues					
Cross Media Transfer	SCAQMD	Crystal Ball	Addressing the issue of increase in cross-media pollutant transfer as a result of additional rules and regulations.		
Future List of Carcinogenic Substances	CARB	Crystal Ball	Addressing the possibility of CARB finding more substances commonly discharged from wastewater to be carcinogenic.		

# **Appendix K Thermal Drying Information**

### **Appendix K Thermal Drying Information**

	Table H-1					
Types of Heat Dryers Comparison						
HEAT DRYING EQUIPMENT	ADVANTAGES	DISADVANTAGES				
ROTARY DRUM DRYERS-DIRECT TYPE	<ul> <li>Suitable for intermittent operation</li> <li>High efficiency</li> <li>Produces well-sorted, round pellets (1-4 mm dia)</li> <li>Virtually no dust problems (provided with screens)</li> <li>8 installation in North America from ~ 10 years old to 2 years old</li> </ul>	-Requires large heat exchanger				
BELT DRYERS - DIRECT TYPE	- No installations in North America	<ul> <li>Material produced is non-uniform in shape and size and requires pelletizing equipment</li> <li>Large units are required due to low drying temperature (~300F)</li> <li>Not enough installation to estimate O&amp;M costs</li> </ul>				
FLASH DRYERS- DIRECT TYPE	- 2 installation in North America ~ 14 years old	<ul> <li>Safety issues</li> <li>Requires high temperature (~1200 degree F) for operation</li> <li>Requires tall tubes (~50 to 60 feet)</li> <li>If not controlled properly can burn sludge skin while outside is wet</li> <li>No pellets are created and dust may be a problem</li> <li>Not enough installations to estimate O&amp;M costs</li> <li>Low efficiency</li> <li>No new units planned</li> </ul>				
PADDLE DRYERS - INDIRECT TYPE	No installations in North America on municipal biosolids	<ul> <li>- Produces small size pellets with significant dusting potential</li> <li>- Requires steam (~14,000 lb./hr at 160 psi)</li> <li>-Not suitable for intermittent operation</li> </ul>				
DISK TYPE DRYERS - INDIRECT TYPE	- 1 installations in North America	<ul> <li>Produces small size pellets with significant dusting potential</li> <li>Low efficiency</li> <li>Not suitable for intermittent operation</li> </ul>				
MULTIPLE HEARTH DRYERS – INDIRECT TYPE	1 installation in North America ~ 7 years old & one under construction	Requires steam or hot oil     Not suitable for intermittent operation				
FLUIDIZED BED- DRYERS	- 1installation in North America started up in 2000	<ul><li>Safety issues</li><li>Not suitable for intermittent operation</li></ul>				



#### Typical Safety Design for Rotary Drum Dryers

Dryers have had some safety issues during the development of the different types of dryers. However, as the numerous successful installations show, manufacturers that understand the process of biosolids drying and the need to provide an integrated system, can provide dryers that operate safely. The key process parameters that must be maintained to ensure safe operation are described below.

The outbreak of fire or deflagration is contingent on the presence of a certain amount of gas, dust and oxygen as well as a certain ignition energy (temperature, sparks). To prevent ignition it is sufficient to limit any of these three factors. The limit values for sewage sludge are:

Dust $< 60 \text{ g/Nm}^3$ Oxygen< 10 %Granulate temperature $< 110 \circ \text{C}$ 

Wet sludge dosing - In the area of the wet sludge dosing, methane is released, which basically results in the risk of gas explosion. With the gas extraction from the wet sludge silo the methane content is kept to below 1 percent of volume, the risk of gas explosion is averted. A measuring NEMA 7 probe monitors the efficiency of the extraction; an emergency power supply is switched on in case of power failure.

<u>Drying and loading</u> - By reducing the oxygen content in the circulating air loop to below 10%, the outbreak of fire and explosions are prevented. Inerting is achieved with the furnace fumes. Granulate is fed to the dryer inlet at high temperatures, the circulating temperature drops very quickly in co-current operation, which ensures that the final drying of the already dry granulate takes place at low temperature. After drying the granulate is cooled to a temperature below < 70 o C. Auto-ignition in the silo is thus avoided.

Additional safety measures are the formation of the granulate in the mixer inherent in the process, where the dust is integrated, as well as the use of explosion proof rated measuring instruments. The arrangement of the main fan on the clean gas side of the circulating air loop and the use of externally placed bearings for the conveyors gives additional safety. Ignition sparks are prevented by limiting the speed of moving metal parts to 1 m/s. The belt of the elevator is also checked for movement in a slanting direction, and all units are electrically grounded.



				Table H-2				
			Andritz Rotary	Drum Dryer North	America Re	ference List		
Item	Location	State	Dryer Model	Year Installed	DTPD	MGD	Contact	Disposal Route
1.	Waco	TX	DDS 40	1994/1995	25	22	Tom Clark T: (254) 662 1501	Agriculture
2.	Amherst	NY	DDS 20	1997	10	15	Tim Garrison T: (716) 691 9771	Agriculture Landfill
3.	Ocean County	NJ	2 x DDS 40	1996/1997	50	25 20 20	Dave Ertle T: (732) 269 4500	Agriculture
4.	Sumter	SC	DDS 40	1997/1998	24	12	David Thompson T: (803) 481 0677	Agriculture
5.	Poughkepsie	NY	Disc	1996/1997	1.65	8	Sam Du'Bois T: (914) 471 8165	Landfill
6.	Aiken	SC	DDS 40	1998/99	24	20	Ron Bibb T: (803) 278 1911	Agriculture
7.	Leesburg	VA	DDS 20	2001/2002	21.55	5	Steve Cawthron T:703) 737 7100	Agriculture
8.	Jacksonville	FL	DDS 70	2001/2002	64	52.5 50.3	Kenneth Blanton Black & Veatch T: (904) 665 4450	Agriculture
9.	Pensacola	FL	2 x CDS 35	2000	30.9	25	Bernie Dahl T: (850) 969 3380	Agriculture
10.	Louisville	KY	4 x DDS 90	2001/2002	4 x 78	180	Blake Childress Black & Veatch T: (704) 548 8461	Agriculture
11.	Pinellas County	FA	DDS 40	2001/2002	25	30	Jim Carmichael Synagro T: (718) 991 7417	Agriculture



			Table H-3							
	Andritz Rotary Drum Dryer Municipal Installation List									
Installation No.	Client	Location	Material DS %	Type Model	EV lbs./hr	Fuel	Material DS %	Utilization	Start- up	
059	Palm GmbH & Co. KG	Wörth Germany	16	CDS/ 1xD5L	3550	Steam	granulate ≥92	pending	2002	
058	Synagro for Pinellas County Utilities	St. Petersburg, FL USA	digested sludge 22	DDS DDS-40	8800	natural gas + biogas	granulate ≥92	agriculture / reuse	2002	
057	Southern Water	Hastings GB	digested sludge 25	DDS DDS-40	8800	natural gas + biogas	granulate 92	agriculture / fuel	2002	
056	Southern Water	Sandown GB	digested / undigested sludge 25	DDS <sup>d</sup> DDS-20	4400	natural gas + biogas	granulate 92	agriculture / fuel	2001	
055	JEA	Jacksonville, FL, USA	digested sludge 25	DDS <sup>d</sup> DDS-70	16,300	natural gas / digested gas	granulate 92	agriculture	2001	
054	Louisville and Jefferson County MSD	Loisville, KY USA	digested sludge 25	DDS90 4 X DDS-90	18,700	natural gas / digested gas	granulate 92	agriculture	2001	
053	AgroSol	Moss Norway	Digested sludge; fertilizer based on raw sludge/food waste	DDS	18,700	Natural gas + biogas	Granulate ≥ 90	fertilizer	2001	
052	ESI	Rehau Germany	sewage sludge / tannery waste 30	CDS	Max.198 Min. 66	diesel, oil from con- version	granulate ≥ 93	con-version into oil	2000	
051	City of Leesburg	Leesburg, VA <i>USA</i>	digested sludge 23	DDS <sup>d</sup> DDS-20	4400	natural gas	granulate	agriculture	2001	
050	West of Scotland Water Authorities	Glasgow-Daldowie GB/Scotland	Mixed municipal/industrial	DDS <sup>d</sup> 6 X DDS-50	6 x 10,500	natural gas	granulate 92	fuel	2001	
049	Southern Water	Portsmouth Budd's Farm GB	digested sludge 25	DDS <sup>d</sup> DDS-50	11,000	natural gas + biogas	granulate 92	agriculture /fuel	2001	

			Table H-3						
		Andritz	Rotary Drum Dryer Mur	nicipal Insta	llation List	1			
Installation No.	Client	Location	Material DS %	Type Model	EV lbs./hr	Fuel	Material DS %	Utilization	Start- up
048	Southern Water	Bognor & Littlehampton (Ford) GB	digested sludge 25	DDS <sup>d</sup> DDS-30	5500	natural gas + biogas	granulate 92	agriculture /fuel	2001
047	Escambia County Utility Authority	Pensacola, FL <i>USA</i>	Undigested sludge 25	CDS 2 X CDS-35	7600	natural gas	granulate	agriculture	2000
046	EMTE S.A.	Granollers Spain	digested sludge 23	DDS <sup>i</sup> DDS-20	4400	Motor off gas / natural gas	granulate	agriculture/f uel	1999
045	Dwr Cymru / Welsh Water	Afan Wales / Great Britain	raw sludge 18	DDS <sup>d</sup> DDS-70	15,400	Natural gas	granulate	agriculture/f uel	2000
044	Northumbrian Water Ltd	Bran Sands, Phase II Great Britain	raw sludge 24.5	DDS <sup>d</sup> 4 X DDS-50	4x 11,000	Natural gas / kerosene	granulate	fuel or agriculture	2001
043	Aiken County Public Service Authority	Horse Creek WWTP SC, USA	aerobically digested sludge 18	DDS <sup>d</sup> DDS-40	9900	Natural gas	granulate	agriculture	2000
041	Welsh Water	Cardiff Great Britain	raw sludge 18	DDS <sup>d</sup> 2 X DDS-70	2x 16,755	Natural gas	granulate	pending	2001
039	City of Düsseldorf	Düsseldorf-Süd STW Germany	digested sludge 25	Recons. disc dryer DDS-20	2x 7900	saturated steam	granulate <i>95</i>	landfill	1998
036	Stadtwerke Mosbach	Obrigheim <i>Germany</i>	raw sludge 27	CDS/ EcoDry CDS-05	1200	granulate and fuel oil	granulate/ ash 90/-	fuel/ landfill	1998
035	City of Düsseldorf	Düsseldorf-Nord STW Germany	digested sludge 32	DDS <sup>i</sup> DDS-30	5900	natural gas/ biogas	granulate 95	fuel	1998
034	Town of Perth	Subiaco STW Australia	raw sludge 28	DDS <sup>i</sup> DDS-30	6600	natural gas/ flue gas	granulate <i>95</i>	fuel	1998
033	Town of Graz	Gössendorf STW Austria	digested sludge 30	DDS <sup>i</sup> DDS-30	6600	natural gas	granulate 60/92	fuel	1997



			Table H-3	3					
Andritz Rotary Drum Dryer Municipal Installation List									
Installation No.	Client	Location	Material DS %	Type Model	EV lbs./hr	Fuel	Material DS %	Utilization	Start- up
032	Northumbrian Water	Bran Sands Gr. Britain	raw sludge	DDS <sup>d</sup> + <sup>i</sup> 3 X DDS-50	3 x 11000	waste heat from gas turbines, natural gas	granulate 92	fuel or agriculture	1998
030	Ton of Pécs	Pécs STW Hungary	raw sludge 25	DDS/ EcoDry DDS-40	8800	natural gas and granulate	granulate/ ash 90/-	fuel/ landfill	1997
029	City of Sumter	Sumter WWTP S.C., USA	digested sludge 17	DDS <sup>d</sup> DDS-40	8800	natural gas/ waste wood	granulate 92	agriculture	1997
028	Town of Tübingen	Tübingen STW Germany	digested sludge 30	DDS <sup>i</sup> DDS-30	4000	biogas/ natural gas	granulate 90	landfill	1998
027	Ocean County Utility Authority	Bayville STW N.J., USA	digested sludge 18	DDS 2 X DDS-40 <sup>d</sup>	2 x 8800	fuel oil or natural gas	granulate 92	agriculture	1997
026	Town of Miskolc	STW Miskolc Hungary	raw sludge 25	DDS <sup>d</sup> DDS-30	6600	natural gas	granulate 90	landfill	1997
025	Town of Bad Säckingen Kreis Waldshut	Bad Säckingen STW Germany	digested/ raw sludge 18 – 40	DDS <sup>d</sup> DDS-40	8400	natural gas	granulate 95	fuel for cement factory	1996
024	Town of Amherst	Amherst WWTP N.Y., USA	digested sludge 25	DDS <sup>d</sup> DDS-20	4400	natural gas/ biogas	granulate 90	agriculture	1997
023	Waste Water Asso. of Reggio Emilia	Reggio Emilia STW Italy	digested sludge	DDS 2 X DDS-40 <sup>d</sup>	2 x 8800	natural gas	granulate 90	landfill	1994
021	Brazos River Authority	Waco WWTP Texas, USA	digested sludge 18	DDS⁴ DDS-40	9900	natural gas/ biogas	granulate 90	agriculture	1995
020	Town of Solofra	Solofra STW Italy	digested sludge	DDS <sup>d</sup> 2 X DDS-20	2 x 8800	natural gas	granulate 90	agriculture	1993
019	Leather industry of Arzignano	Arzignano STW  Italy	raw sludge 40	DDS <sup>d</sup> 2 X DDS-40	2 x 8800	natural gas	granulate 90	landfill	1993
017	Town of Györ	Györ STW Hungary	raw sludge 25	DDS <sup>d</sup> DDS-30	6600	natural gas	granulate 90	agriculture	1993
016	Town of Lucca	Lucca STW Italy	digested sludge 35	DDS <sup>d</sup> DDS-10	2200	natural gas	granulate 90	landfill	1992
014	Waste Water Assoc. of Oyten/ Ottersberg	STW of WWA Germany	digested sludge	DDS <sup>d</sup> DDS-10	2900	natural gas/ biogas	granulate 92	agriculture	1991

	Table H-3								
Andritz Rotary Drum Dryer Municipal Installation List									
Installation No.	Client	Location	Material DS %	Type Model	EV lbs./hr	Fuel	Material DS %	Utilization	Start up
012	Town of Pécs	Pécs STW Hungary	raw sludge 25	DDS <sup>d</sup> DDS-40	8800	natural gas	granulate 90	landfill	1990
011	Waste water assoc. of Zürich/ Dübendorf	Neugut /Dübendorf STW Switzerland	raw sludge from 1997 digested 25	DDS <sup>d</sup> DDS-20	5300	natural gas/ thermal oil in a circuit	granulate 92	agriculture	1990
009	Town of Ascoli	Ascoli STW Italy	digested sludge 18	DDS <sup>d</sup> DDS-10	2200	natural gas/ biogas	granulate 90	landfill	1989
800	Town of Sassari	Sassari STW  Italy	raw sludge 20	DDS <sup>d</sup> DDS-10	2200	natural gas/ biogas	granulate 90	landfill	1988
007	Town of Cesena	Cesena STW	raw sludge since 1991 digested sludge 20	DDS <sup>d</sup> DDS-10	3300	natural gas/	granulate 90	agriculture	1986
004	Town of Bratislava	Bratislava STW Slovakia	digested sludge 20	DDS <sup>d</sup> DDS-30	6600	biogas/natur al gas	granulate 90	agriculture	1982
003	Town of Eger	STW Eger Hungary	raw sludge 18	DDS <sup>d</sup> DDS-20	4400	natural gas	granulate 90	agriculture	1981
001	Town of St. Gallen	St. Gallen STW Switzerland	digested sludge	DDS⁴ DDS-50	11400	fuel oil	granulate 90	landfill	1974 recons





City of Los Angeles Integrated Resources Plan

Volume 1: Wastewater Management



FACILITIES PLAN FINAL



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